A REPORT ON THE

Weight Status of Manitoba Children

Manitoba

Preface

The Canadian Community Health Survey (CCHS) 2.2 on Nutrition, a joint initiative of Statistics Canada and Health Canada, was conducted in 2004. To maximize the opportunities presented by this national survey, Manitoba Health and Healthy Living, in partnership with Healthy Child Manitoba, purchased additional information and expanded the sample of Manitoba children (ages one to 18). This enhanced sample allowed for selective data analysis of four combined health regions in Manitoba: Burntwood, NOR-MAN and Churchill; Assiniboine, Parkland and Brandon; North Eastman, South Eastman, Interlake and Central; and Winnipeg.

Manitoba Health and Healthy Living is developing a series of reports on the weight status, nutritional intake and physical activity levels of Manitobans. This first report focuses on the weight status of children across the province. Subsequent reports will describe the weight status of adults across Manitoba and more detailed information about food intake of both children and adults. These reports are intended for managers, planners, professionals or researchers working in government, regional health authorities, universities and non-governmental organizations to assist in developing evidence-based programs and policies. This type of information has been identified as a departmental priority given that healthy eating, active living and chronic disease prevention are three components of healthy living.

The purpose of this report is to describe the prevalence of healthy weights, overweight and/or obesity in children relative to their gender, age, place of residence, parental socio-economic status, aboriginal status and physical/sedentary activity levels. Current programs and policies related to healthy eating, physical activity and chronic disease prevention available at the provincial and regional health authority levels are summarized.

Key Findings

Description of Weight Status for Manitoba Children

Overall Description:

- Nearly 70 per cent of Manitoba children fell within a normal weight range.
- Nearly 1/3 of Manitoba children (31 per cent) were overweight or obese.
- Nearly 1/4 of Manitoba boys and girls (22 per cent) were overweight.
- Almost one in 10 Manitoba children (nine per cent) was obese.

Age and gender effects:

- The prevalence of overweight/obesity among Manitoba children increased with age, from 23 per cent for children two to five years of age, to 30 per cent for six to 11-year-olds and to 36 per cent for 12 to 17-year-olds.
- The prevalence of overweight/obesity appeared to be higher in two to five-year-old girls (29 per cent) than boys in the same age group (19 per cent). This may have been due to a small sample size, as this gender difference disappeared in older age groups for which the sample size was larger.
- Almost four in 10 adolescents were overweight/obese (37 per cent of boys and 35 per cent of girls).
- The prevalence of overweight/obesity in off-reserve aboriginal boys (40 per cent) and girls (43 per cent) was higher than the prevalence of overweight/obesity among non-aboriginal boys (29 per cent) and girls (30 per cent). This difference was not statistically significant and may have been due to a small sample size of off-reserve aboriginal children.

Regional Differences in Weight Status

- The prevalence of overweight/obesity was highest in northern Manitoba, lower in southwestern Manitoba and Winnipeg. The lowest rates occurred in southeastern/central parts of the province.
- The prevalence of overweight/obesity for two to 11-year-olds was consistent between regions, ranging from 21 per cent to 34 per cent. The exception was boys two to 11 years of age in the southeastern/central regions of Manitoba, where the prevalence of overweight/obesity was found to be 15 per cent.
- A trend towards increased overweight/obesity rates was observed among adolescents living in northern Manitoba compared to southern parts of the province. In the north, nearly half of adolescents (43 per cent of boys; 45 per cent of girls) were overweight or obese compared to approximately 37 per cent in Winnipeg (35 per cent of boys; 41 per cent of girls), approximately 33 per cent in southwestern (36 per cent of boys; 27 per cent of girls) and 33 per cent in southeastern/central Manitoba (41 per cent of boys; 25 per cent of girls).

Effects of the Determinants of Health on Weight Status

- Nearly half of children whose parents did not complete high school were overweight/obese.
- The prevalence of overweight/obesity decreased as parental education and household income increased.
- Over 40 per cent of children from food-insecure households were overweight/obese. Boys from food-insecure households were twice as likely to be overweight/obese as compared to boys from food-secure homes. No association was noted in girls; this may have been due to a small sample size.

Effects of Active Living on Weight Status

- The prevalence of overweight/obesity was higher among boys six to 11 years of age who were sedentary for two or more hours per day compared to boys who were sedentary for less than two hours per day.
- Active and moderately active adolescents had a relatively lower prevalence of overweight/obesity compared to those who were inactive.
- 70 per cent of adolescent boys who were active for less than 15 minutes per day were either overweight or obese.

- 40 per cent of adolescents who were sedentary ≥ three hours per day were overweight/obese.
- Girls 12 to 17 years old who were sedentary ≥ three hours per day were more likely to be overweight/obese as compared to girls who were sedentary < three hours per day.
- Adolescent boys who were infrequently active were over four times more likely to be overweight/obese as compared to boys who were regularly or occasionally active.

Effects of Healthy Eating on Weight Status

- Children two to 17 years who ate fruits and vegetables less than five times per day were more likely to be overweight/obese compared to those who had fruits and vegetables five times or more per day.
- Girls 12 to 17 years old who ate fruits and vegetables less than five times per day were significantly more likely to be overweight/obese compared to those who had fruits and vegetables five times or more per day. No such association was identified in boys 12 to 17 years of age.

Contents

Preface i

Key Findings ii

Introduction
Introduction 7
Causes of Obesity 7
Health Consequences 8

Methods
Data Source: CCHS 2.2 Survey Design and Sample 9
Statistical Analysis 12
Limitations 12

Findings
A. Description of Weight Status for Manitoba Children 13
B. Regional Differences in Weight Status 18
C. Effects of Determinants of Health on Weight Status 26
D. Effects of Active Living on Weight Status 30
E. Effect of Healthy Eating on Weight Status 35

Summary 39

References 41

Appendix A:
Definition of Overweight and Obesity in Children and Adolescents 44

Appendix B:
Manitoba Government and Regional Health Authority Initiatives related to Healthy Eating, Active Living and Chronic Disease Prevention 45

Appendix C:
Detailed Technical Tables 47

Appendix D:
Definitions of Variables 50

Appendix E:
Acknowledgments 52

List of Tables

Table 1.	Description of the Manitoba Population by Age Group and Gender	10
Table 2.	Description of the Manitoba Population by Age Group and Gender by Combined Health Regions	10
Table 3.	Description of the Manitoba Population with Measured Body Mass Index by Age Group and Gender	11
Table 4.	Description of the Manitoba Population with Measured Body Mass Index by Age Group and Gender by Combined Health Regions	11

List of Appendix Tables

Table A.1	International Obesity Task Force Definitions of Overweight and Obesity in Children and Adolescents	44
Table C.1	Descriptive Statistics of Overweight and Obese Children by Age Group and Gender in Manitoba (2004)	47
Table C.2	Multivariable Logistic Regression Analyses on the Risk Factors for Overweight/Obesity in Boys and Girls 2 to 17 years old in Manitoba (2004)	48
Table C.3.	Multivariable Logistic Regression Analysis on Risk Factors for Being Either Overweight or Obese for Boys and Girls 2 to 11 years old in Manitoba (2004)	48
Table C.4	Multivariable Logistic Regression Analyses on Physical and Sedentary Activity and Daily Fruit and Vegetable Consumption by Overweight/Obese Manitoba Adolescents 12 to 17 years old (2004)	49
Table D.1	Family Income Adequacy Quartiles	50

List of Figures

Figure 1.	Regional Health Authorities of Manitoba	9
Figure 2.	Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years old	14
Figure 3.	Prevalence of Overweight/Obesity in Manitoba Children by Age Group	15
Figure 4.	Prevalence of Overweight/Obesity in Manitoba Children by Age Group and Gender	16
Figure 5.	Prevalence of Overweight/Obesity in Non-Aboriginal and Off-Reserve Aboriginal Children 2-17 Years old in Manitoba	17
Figure 6.	Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years old by Combined Regional Health Authorities	19

Figure 7. Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years old by Combined Regional Health Authorities by Gender 20

Figure 8. Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years old by Age Group and Combined Regional Health Authorities 21

Figure 9. Prevalence of Overweight/Obesity in Manitoba Children 2-11 Years old by Combined Regional Health Authorities 22

Figure 10. Prevalence of Overweight/Obesity in Manitoba Children 2-11 Years old by Combined Regional Health Authorities by Gender 23

Figure 11. Prevalence of Overweight/Obesity in Manitoba Adolescents 12-17 Years old by Combined Regional Health Authorities 24

Figure 12. Prevalence of Overweight/Obesity in Manitoba Adolescents 12-17 Years old by Combined Regional Health Authorities by Gender 25

Figure 13. Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years old by Total Family Income 27

Figure 14. Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years old by Highest Level of Parental Education 28

Figure 15. Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years old by Food Insecurity 29

Figure 16. Prevalence of Overweight/Obesity in Manitoba Children 6-11 Years old by Hours of Daily Physical Activity 31

Figure 17. Prevalence of Overweight/Obesity in Manitoba Children 6-11 Years old by Hours of Daily Sedentary Activity 32

Figure 18. Prevalence of Overweight/Obesity in Manitoba Adolescents 12-17 Years old by Daily Physical Activity > 15 Minutes 33

Figure 19. Prevalence of Overweight/Obesity in Manitoba Adolescents 12-17 Years old by Weekly Sedentary Activity 34

Figure 20. Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years old by Daily Juice Consumption 36

Figure 21. Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years old by Daily Fruit and Vegetable Consumption 37

Figure 22. Prevalence of Overweight/Obesity in Manitoba Adolescents 12-17 Years old by Daily Fruit and Vegetable Consumption 38

Introduction

The increasing rate of childhood obesity has been recognized as a major public health issue in developed countries (Ebbeling et al, 2002; Shields, 2005). Use of a public health lens to examine obesity is important since promotion of healthy living and prevention of obesity requires multiple interventions and collaboration across professions and sectors. Promoting healthy weights is challenging, as it involves issues of genetics, dietary and physical activity choices, as well as social, cultural, physical and economic environments (World Health Organization [WHO], 2003; Clement & Ferre, 2003).

Childhood obesity has been described as an international epidemic by the World Health Organization (WHO) (WHO, 2000). This is well documented in developed nations. For example, in the United States, obesity among children and youth ranges from 12.3 per cent in non-Hispanic whites to 21.8 per cent among Hispanics (Strauss & Pollack, 2001). In Israel, obesity ranges from 8.4 per cent in fifth-grade girls to 12.7 per cent in second-grade girls (Huerta et al., 2006). However, childhood obesity is also increasingly prevalent in developing countries, such as Brazil where 6.6 per cent of preschool-aged children are obese (Saldiva et al., 1994); Thailand where 7.4 per cent of rural-dwelling and 22.7 per cent of urban-dwelling four to six-year-olds are obese (Sakamoto et al., 2001); or Iran where 7.1 per cent of adolescents are obese (Moayeri et al., 2006). Many low- and middle-income countries are facing a "double burden" of disease as under-nutrition and obesity co-exist within the same country, the same community and even the same household. This double burden is caused by inadequate pre-natal, infant and early childhood nutrition followed by exposure to high-fat, energy-dense, micronutrient-poor foods and lack of physical activity (WHO, 2006).

Childhood obesity trends in Canada are also a cause for concern. According to Statistics Canada, over a period of 26 years between 1978/1979 and 2004, the prevalence of childhood obesity nearly tripled from three per cent to eight per cent. While overweight and obesity among children two to five years old remained stable, the prevalence of overweight among adolescents aged 12 to 17 years increased by more than twofold, from 14 per cent to 29 per cent (Shields,

2004). The prevalence of childhood overweight/obesity in Manitoba in 2004 was significantly higher than the national average, 31 per cent vs. 26 per cent (Shields, 2004). While others have reported on the prevalence of overweight and/or obesity for Canadian provinces (Shields & Tjepkema, 2006; Willms et al., 2005), this is the first report of overweight and/or obesity in children that provides specific details for the province of Manitoba. Further, this is the first report to our knowledge that identifies the following risk factors for childhood overweight/obesity: age and food insecurity among boys, parental education among girls, and certain geographic locations.

Causes of Obesity

The fundamental cause of obesity and overweight is an energy imbalance between energy (calories) consumed and energy (calories) expended. Global increases in overweight and obesity have been attributed to two main factors. The first is a global shift in diet towards an increased intake of energy-dense foods that are high in fat and sugars but low in fibre, vitamins, minerals and other micronutrients. The second is the trend towards decreased physical activity due to the increasingly sedentary nature of work, changing modes of transportation and increasing urbanization (WHO, 2006).

Modern social and physical environments have been identified as being obesogenic. This new term has been defined as "the sum of influences that the surroundings or conditions have on promoting obesity in populations" that has brought about changes in eating patterns and physical activity that underlie the obesity epidemic (Stanton, 2006; Washington, 2006; Booth et al., 2005; Swinburn et al., 1999).

The WHO (2000) cites low socio-economic status (SES) in industrialized nations as a risk factor for obesity. Other factors associated with an increased risk of overweight or obesity are low family income (Sherry et al., 2004; Phipps et al., 2006) and low parental education (Veugelers & Fitzgerald, 2005), especially parents who do not finish high school (Janssen et al., 2006). Food insecurity, the limited uncertain availability of nutritionally adequate foods or a limited uncertain ability to acquire foods in a socially acceptable way, is also associated with an increased risk of overweight or obesity (Che & Chen, 2001). Individuals living in food-insecure households in Canada are more likely to report chronic conditions such as heart disease, diabetes and high blood pressure (Vozoris & Tarasuk, 2003).

Health Consequences

The impact of obesity can be profound in terms of its potential health and psychosocial consequences. Children and adolescents who are overweight or obese have an increased risk of developing chronic diseases such as cardiovascular disease, high blood pressure, some cancers and Type 2 diabetes. They are also at increased risk to become overweight or obese adults (Freedman et al, 2005). Unfortunately, research shows that once an individual is overweight or obese, the tendency is to gain more weight rather than lose it (Institute of Medicine, 1995). Children and adolescents who are overweight and obese may exhibit disordered eating (Hill et al., 1994), decreased body satisfaction (Hill et al., 1994) and low self-esteem (Mirza et al., 2005).

From a systems perspective, a 2004 study suggests that the total costs of obesity in Canada were $4.3 billion, of which direct costs[1] totaled $1.6 billion and indirect costs[2] were $2.7 billion (Katzmarzyk & Janssen, 2004).

Footnotes

1 Direct costs are associated with payments, such as cost of treatments, and care and rehabilitation for illnesses resulting from overweight and obesity.

2 Indirect costs relate to lost resources, including decreased productivity due to poor health, absenteeism, disability and premature death that occur due to overweight and obesity.

Methods

Data Source: CCHS 2.2 Survey Design and Sample

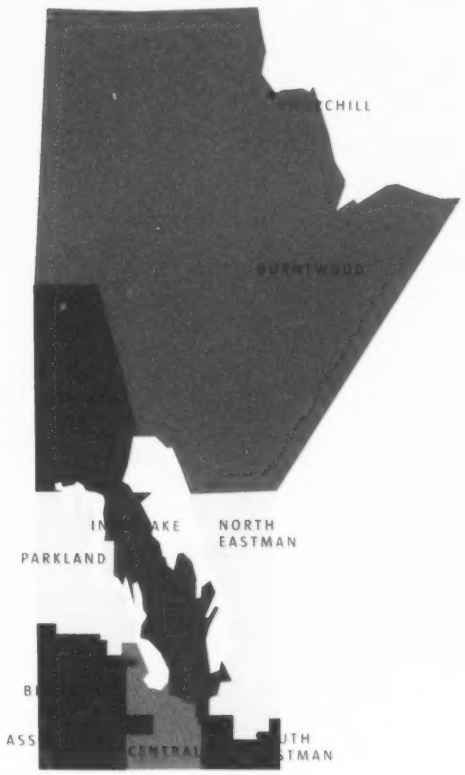
The CCHS 2.2 on Nutrition, a joint initiative of Statistics Canada and Health Canada, is the first Canadian survey to provide national, provincial and certain regional level nutrition data in over 30 years. Manitoba Health and Healthy Living in partnership with Healthy Child Manitoba, purchased additional information for Manitoba children (ages one to 18 years) to enhance data analysis at combined health region levels. The enhanced child sample provides the first ever nutrition-related data on children in Manitoba at a sub-provincial level, specifically Winnipeg, northern Manitoba, southeastern/central Manitoba and southwestern Manitoba. (See Figure 1)

The CCHS survey methods have been described elsewhere by Shields (2005). The CCHS 2.2 used measured heights and weights of a nationally representative sample of Canadians, including children and youth. Heights and weights were measured for 1,172 out of 1,651 (71 per cent) of CCHS 2.2 Manitoba respondents between two and 17 years of age. Residents of the three territories, Aboriginal reserves, remote areas and regular members of the Canadian Armed Forces were not included in this survey.

Tables 1 and 2 describe the Manitoba Children Sample, which includes the base number of samples collected by Statistics Canada and the additional sample purchased by the Manitoba government.

Figure 1.
Regional Health Authorities of Manitoba

Source:
http://www.gov.mb.ca/health/rha/rhamap.html



Combined Health Regions

NORTHERN
Burntwood
NOR-MAN
Churchill

SOUTHWESTERN
Assiniboine
Parkland
Brandon

SOUTHEASTERN CENTRAL
North Eastman
South Eastman
Interlake
Central

WINNIPEG

Table 1.

Description of the Manitoba Population

by Age Group and Gender

	GENDER			
Age Group (Years)	**Boys**	**% Weighted Sample**	**Girls**	**% Weighted Sample**
2-5	200	23.8	188	23.2
6-11	279	33.2	274	33.8
12-17	361	43.0	349	43.0
Total	840	100.0	811	100.0

Total both boys and girls N=1651

Table 2.

Description of the Manitoba Population

by Age Group and Gender by Combined Health Regions

	NORTHERN[1]		SOUTHWESTERN[2]		SOUTHEASTERN CENTRAL[3]		WINNIPEG[4]	
	n	%	n	%	n	%	n	%
Age Group								
2-5	112	28.9	99	25.5	90	3.2	87	22.4
6-11	135	24.4	128	23.2	161	29.1	129	23.3
12-17	187	26.3	166	23.4	193	27.2	164	23.1
Total	434	26.3	393	23.8	444	26.9	380	23.0
Gender								
Boys	215	13.0	231	14.0	192	11.6	202	12.2
Girls	219	13.3	213	12.9	201	12.2	178	10.8

Total both boys and girls N=1651

[1]= Burntwood/ NOR-MAN/ Churchill
[2]= Assiniboine/ Parkland/ Brandon
[3]= NorthEast/ SouthEast/ Interlake/ Central
[4]= Winnipeg

Table 3.

Description of the Manitoba Population with Measured Body Mass Index

by Age Group and Gender

BOYS

Age Group	n	% Weighted Sample	Representing Population
2-5	123	24.9	33733
6-11	193	31.5	41498
12-17	278	43.6	48762
Total	594	100.0	123992

GIRLS

Age Group	n	% Weighted Sample	Representing Population
2-5	115	17.4	21468
6-11	189	36.9	42575
12-17	274	45.6	45020
Total	578	100.0	109063

Table 4.

Description of the Manitoba Population with Measured Body Mass Index

by Age Group and Gender by Combined Health Regions

	NORTHERN[1]		SOUTHWESTERN[2]		SOUTHEASTERN CENTRAL[3]		WINNIPEG[4]	
	n	%	n	%	n	%	n	%
Age Group								
2-5	51	22.4	65	19.9	59	17.8	63	23.4
6-11	79	36.0	96	34.5	114	34.4	93	33.7
12-17	116	41.6	131	46.6	164	47.8	141	42.9
Total	246	100.0	292	100.0	337	100.0	297	100.0
Gender								
Boys	127	56.4	140	50.6	174	51.2	153	54.3
Girls	119	43.6	152	49.4	163	48.8	144	45.7

[1]= Burntwood/ NOR-MAN/ Churchill
[2]= Assiniboine/ Parkland/ Brandon
[3]= NorthEast/ SouthEast/ Interlake/ Central
[4]= Winnipeg

Statistical Analysis

Statistical analyses were conducted using SAS 9.1 for Windows (SAS Institute). In accordance with Statistics Canada recommendations (Bailie et al., 2002), two estimation procedures were employed for all data analyses. First, the appropriate statistical weight provided by Statistics Canada was used to ensure that the data was representative of the general population. Second, a design-based variance estimation was conducted via Bootstrap technique to reflect the complex multi-stage sampling design of the CCHS 2.2. The Bootstrap analysis generated standard errors and co-efficients of variation. Data were not reported if the co-efficient of variation (CV) for that analysis was greater than 33.3; if the CV was greater than 33.3, it was denoted as "F." Data with a CV between 16.6 and 33.3 should be interpreted with caution. Any reported confidence intervals (CI) refer to the 95th per cent CI, which is equivalent to a statistically significant difference of $p < 0.05$. The Manitoba response rate for the CCHS 2.2 was 76.5 per cent.

Both descriptive statistics and logistic regression analyses were employed for this report. Cross-tabulation analysis using adjusted weights (Bootstrap) produced the estimates for the prevalence of healthy weights, overweight and/or obesity in Manitoba children. Multivariate logistic regression analysis further tested the statistical differences or likelihood of being overweight/obese with regards to the identified characteristics or risk factors. The estimates of healthy weights, overweight and obesity rates were based on directly measured height and weight [Body Mass Index {BMI} = weight (kg) / height $(m)^2$] of 76 per cent of participating children in Manitoba (See Tables 3 and 4). This is higher than the national average of 65 per cent, on whom measured heights and weights were taken (Sheilds, 2006). The cut-offs for BMI classifications recommended by the International Obesity Task Force (International Obesity Task Force [IOTF], 2000) were used to classify overweight and obesity in children (See Appendix A). Following other reports on childhood overweight and/or obesity (Shields, 2004; Shields, 2005), this BMI cut-off does not exclude underweight from normal weight. Due to the small sample size in the two- to five-year-old age group, children ages two to 11 were grouped together to explore any gender differences in the overweight/obesity rate in those sub-regions of Manitoba.

Confounding variables such as age, gender, highest parental education level, household income, food insecurity, ethnicity, physical activity, sedentary activity, fruit and vegetable consumption and combined health regions were used to develop response propensity classes. These classes were used to separate groups that had different characteristics (See Appendix D).

Physical and sedentary activities were measured differently in six to 11-year-olds and 12 to 17-year-olds due to the significant developmental differences by age in children. Therefore, the analysis of overweight/obesity rates by physical and sedentary activities was conducted for two distinct age groups: six to 11 years old and 12 to 17 years old. Accordingly, statistical analyses were conducted separately for each age group. No physical or sedentary activity data were collected on children in two to five years old.

Limitations

This report was based on a 2004 cross-sectional population health survey from Statistics Canada, and thus provides only a snapshot of the current situation in Manitoba. It is not longitudinal in design. Furthermore, some of the sample sizes are small, and as such, must be interpreted with caution. The analytical results presented in this report only provide associations; they do not establish causality. Data on physical and sedentary activities may not represent a clear trend change in BMI in younger children because the modules may not fully reflect physical and sedentary activity habits of children and adolescents. Fruit juice, and fruit and vegetable consumption were based on the number of times consumed daily, rather than measured quantity or serving size. As well, measured BMI was only obtained for 71 per cent of participants. Consequently, this resulted in substantially reduced statistical power because of an inability to fully utilize the survey sample. Lastly, the survey used to collect the data has intrinsic limitations, most notably that the data were largely self-reported, or reported by proxy for children newborn to five years of age and parent-assisted proxy for children six to 11 years old.

Findings

A. Description of Weight Status for Manitoba Children

This section describes the prevalence or rate of overweight and obesity for children two to 17 years old living in Manitoba. Weight status is defined for a number of characteristics of the Manitoba child population such as age, gender and aboriginal status.

Key Findings

Overall Description:

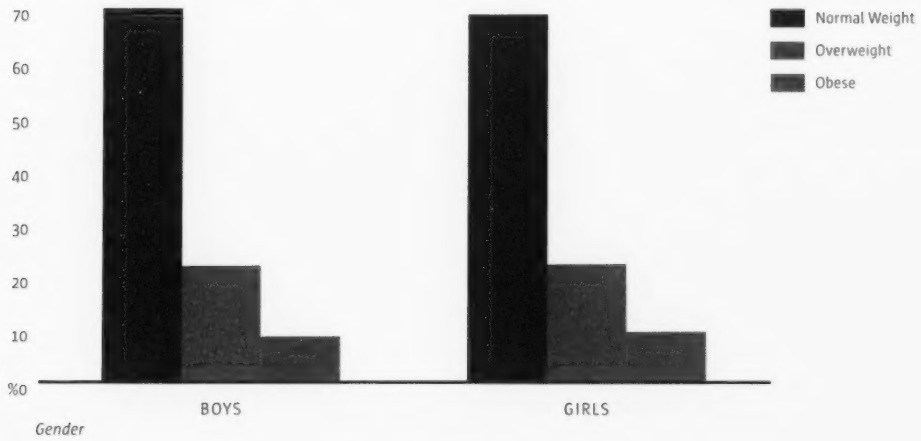
- Nearly 70 per cent of Manitoba children were within a normal weight range.
- Nearly 1/3 of Manitoba children (31 per cent) were overweight or obese.
- Nearly 1/4 of Manitoba boys and girls (22 per cent) were overweight.
- Almost one in 10 Manitoba children (nine per cent) was obese.

Age and Gender Effects:

- The prevalence of overweight/obesity among Manitoba children increased with age, from 23 per cent for children two to five years of age, to 30 per cent for six to 11-year-olds and to 36 per cent for 12 to 17-year-olds.
- The prevalence of overweight/obesity appeared to be higher in two to five-year-old girls (29 per cent) than boys in the same age group (19 per cent). This may have been due to a small sample size, as this gender difference disappeared in older age groups for which the sample size was larger.
- Almost four in 10 of Manitoba adolescents were overweight/obese (37 per cent of boys and 35 per cent of girls).
- The prevalence of overweight/obesity in off-reserve aboriginal boys (40 per cent) and girls (43 per cent) was higher than the prevalence of overweight/obesity among non-aboriginal boys (29 per cent) and girls (30 per cent). This difference was not statistically significant and may have been due to a small sample size of off-reserve aboriginal children.

Figure 2.

Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years Old



	WEIGHT CATEGORY					
	Normal Weight		**Overweight**		**Obese**	
Gender	%	95% CI	%	95% CI	%	95% CI
Boys	69.8	64.6 - 75.0	21.7	17.5 - 25.8	8.5	5.8 - 11.2
Girls	68.6	63.0 - 74.2	22.0	16.9 - 27.0	9.4	6.6 - 12.2

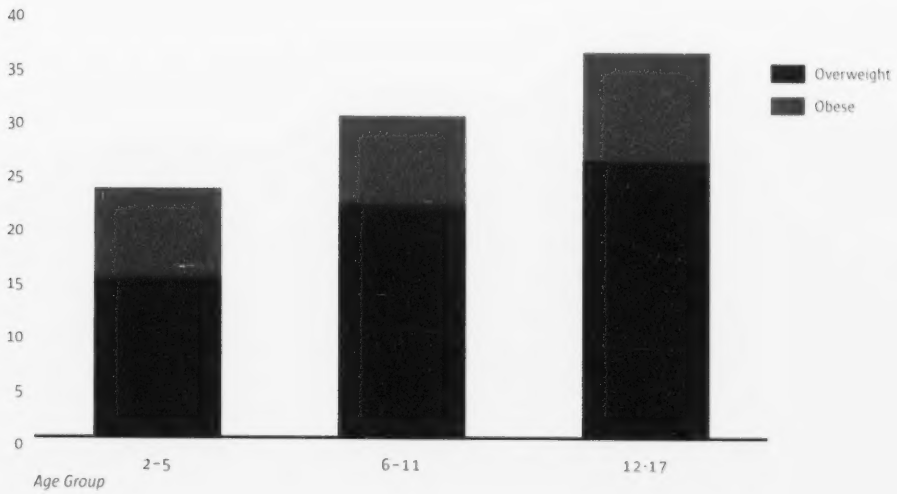
Note: 95% CI refers to the 95th % confidence intervals.

The majority of Manitoba boys and girls were within a normal weight range. Approximately 30 per cent of children were either overweight or obese. There were no significant gender differences associated with the prevalence of overweight and obesity in Manitoba children.

Figure 3.

Prevalence of Overweight/Obesity in Manitoba Children

by Age Group



	WEIGHT CATEGORY			
	Overweight		**Obese**	
Age Group (Years)	%	95% CI	%	95% CI
2-5	15.0	8.6 - 21.3	8.2	3.6 - 12.8
6-11	21.8	17.2 - 26.4	8.2	4.4 - 11.9
12-17	25.9	20.8 - 30.9	10.1	7.5 - 12.6

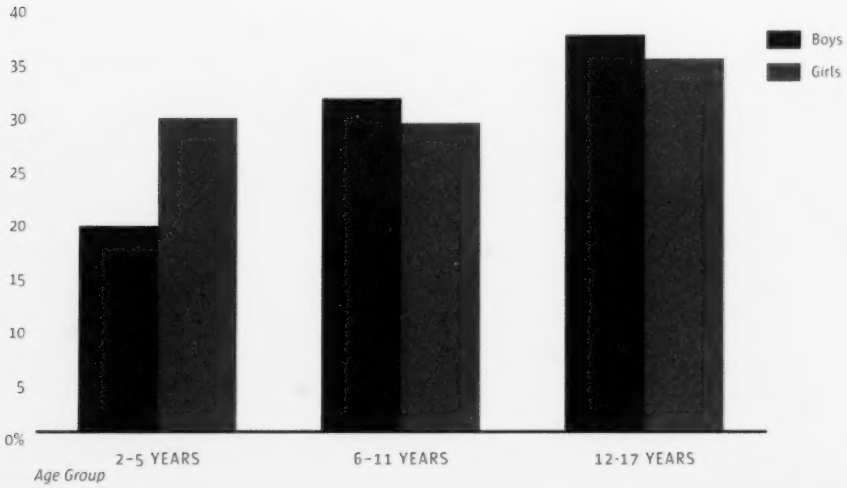
Note: 95% CI refers to the 95th % confidence intervals.

A slightly higher proportion of adolescents (36 per cent) were either overweight or obese compared to children ages two to five years (23 per cent) or six to 11 years (30 per cent). There was an incremental linear trend by age in the prevalence of overweight in Manitoba children, based on combined gender. Obesity among pre-school Manitoba children (8.2 per cent) was similar to the rate of obesity in children aged six to 11 (8.2 per cent). However, more adolescents (10.1 per cent) were obese. It should be noted however, that obesity amongst preschoolers was based on a small sample size; this result should be interpreted with caution.

Figure 4.

Prevalence of Overweight/Obesity in Manitoba Children

by Age Group and Gender



	OVERWEIGHT / OBESE			
	Boys		Girls	
Age Group (years)	%	95% CI	%	95% CI
2-5	19.2	9.5-29.0	29.3	18.5-40.2
6-11	31.1	19.1-43.1	28.8	21.4-36.2
12-17	37.0	29.7-44.2	34.8	24.9-44.6

Note: 95% CI refers to the 95th % confidence intervals.

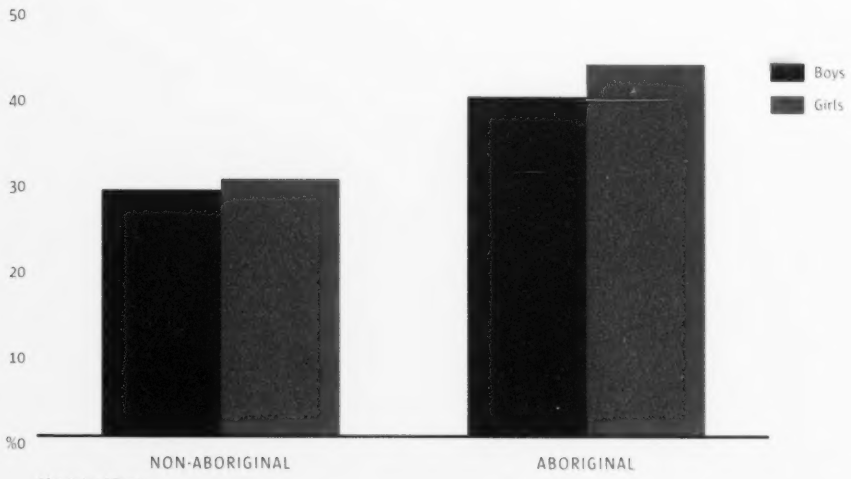
There was a higher prevalence of overweight/obesity in two to five-year-old girls (29 per cent) than the same age group in boys (19 per cent), although this difference was not statistically significant due to a small sample size.

Compared to girls, the proportion of overweight/obese boys increased linearly with age. This difference reached statistical significance when comparing boys two to five years old (19.2 percent CI 9.5 – 29.0) and boys 12 to 17 years old (37.0 percent CI 29.7 – 44.2). Based on logistic regression analyses, older boys were 1.5 times more likely to be overweight/obese than younger boys, based on each incremental age group.

The same trend was not evident for Manitoba girls. Among girls, the prevalence of overweight/obesity was relatively stable until adolescence. Approximately 29 per cent of girls two to five years old and six to 11 years old were overweight/obese. This increased to nearly 35 per cent among girls ages 12 to 17 years.

Figure 5.

Prevalence of Overweight/Obesity in Non-Aboriginal and Off-Reserve Aboriginal Children 2-17 Years Old in Manitoba



	OVERWEIGHT / OBESE			
	Boys		**Girls**	
Aboriginal Status	**%**	95% CI	**%**	95% CI
Non-Aboriginal	**28.7**	23.9 - 33.6	**30.0**	23.3 - 36.6
Aboriginal	**39.6**	19.5 - 59.6	**43.4**	28.2 - 58.7

Note: 95% CI refers to the 95th % confidence intervals.

A higher proportion of off-reserve aboriginal boys (40 per cent) and girls (43 per cent) were overweight/obese as compared to non-aboriginal boys (29 per cent) and girls (30 per cent). However, these differences did not reach statistical significance due to the small sample size of off-reserve aboriginal children.

B. Regional Differences in Weight Status

This section describes the prevalence or rate of overweight and obesity in Manitoba children in the combined health regions. Differences related to geography are addressed by comparing rates between northern, rural and urban settings. Age, gender and aboriginal status were also considered.

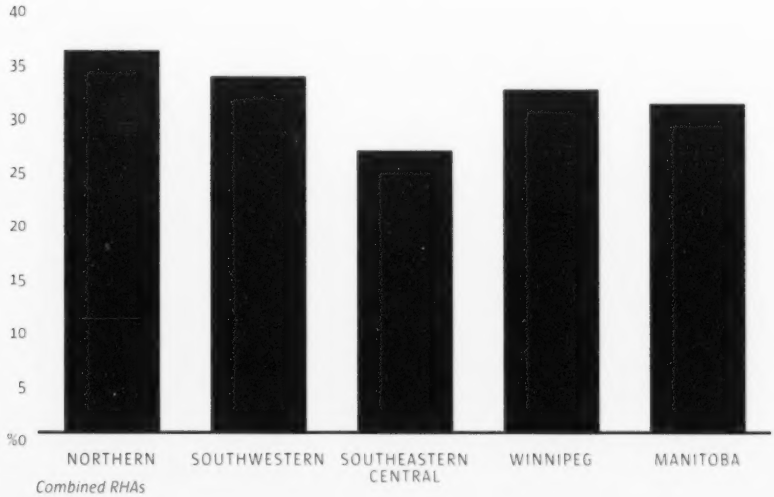
Key Findings

- The prevalence of overweight/obesity was highest in northern Manitoba, lower in southwestern Manitoba and Winnipeg. The lowest rates occurred in southeastern/central parts of the province.
- The prevalence of overweight/obesity for two to 11-year-olds was consistent between regions, ranging from 21 per cent to 34 per cent. The exception was boys two to 11 years of age in the southeastern/central regions of Manitoba, where the prevalence of overweight/obesity was found to be 15 per cent.
- A trend towards increased overweight/obesity rates was observed among adolescents living in northern Manitoba compared to southern parts of the province. In the north, nearly half of adolescents (43 per cent of boys; 45 per cent of girls) were overweight or obese compared to approximately 37 per cent in Winnipeg (35 per cent of boys; 41 per cent of girls), approximately 33 per cent in southwestern (36 per cent of boys; 27 per cent of girls) and 33 per cent in southeastern/central Manitoba (41 per cent of boys; 25 per cent of girls).

Figure 6.

Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years Old

by Combined Regional Health Authorities



	OVERWEIGHT / OBESE		
RHA	%	95% CI	Estimated Population
Northern	35.6	28.5 - 42.6	3431
Southwestern	33.2	26.2 - 40.1	9962
Southeastern Central	26.3	21.6 - 30.9	16374
Winnipeg	32.0	26.8 - 37.1	41860
Manitoba	30.7	27.3 - 34.2	71627

Note: 95% CI refers to the 95th % confidence intervals.

There was a north to south gradient of overweight and obesity in rural Manitoba children. The prevalence of overweight/obesity was highest in northern Manitoba (35.6 per cent), decreased to 33.2 per cent in southwestern Manitoba, and was lowest in southeastern/central Manitoba (26.3 per cent).

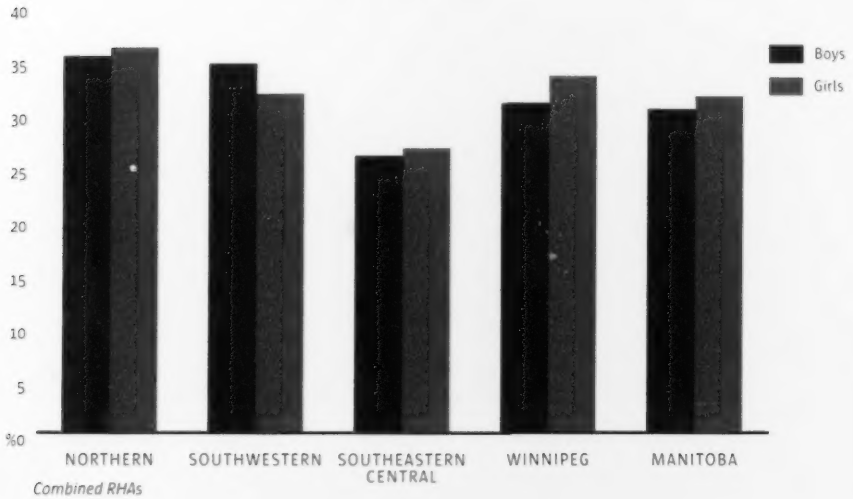
Compared to southeastern/central rural areas, the prevalence of overweight/obesity was higher among children residing in Winnipeg (32.0%).

The average prevalence of childhood overweight/obesity in Manitoba was 30.7 per cent. Based on our weighted estimate, this suggests that nearly 72,000 children in Manitoba are overweight/obese.

Figure 7.

Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years Old

by Combined Regional Health Authorities by Gender



	OVERWEIGHT/OBESE			
	Boys		**Girls**	
RHA	%	CI	%	CI
Northern	35.2	23.6 - 46.8	36.0	27.7 - 44.4
Southwestern	34.5	22.2 - 46.8	31.7	23.4 - 40.1
Southeastern Central	25.9	22.5 - 39.1	26.6	23.2 - 43.5
Winnipeg	30.8	20.4 - 31.4	33.3	19.2 - 34.0
Manitoba	30.2	25.0 - 35.4	31.4	25.8 - 37.0

Note: 95% CI refers to the 95th % confidence intervals.

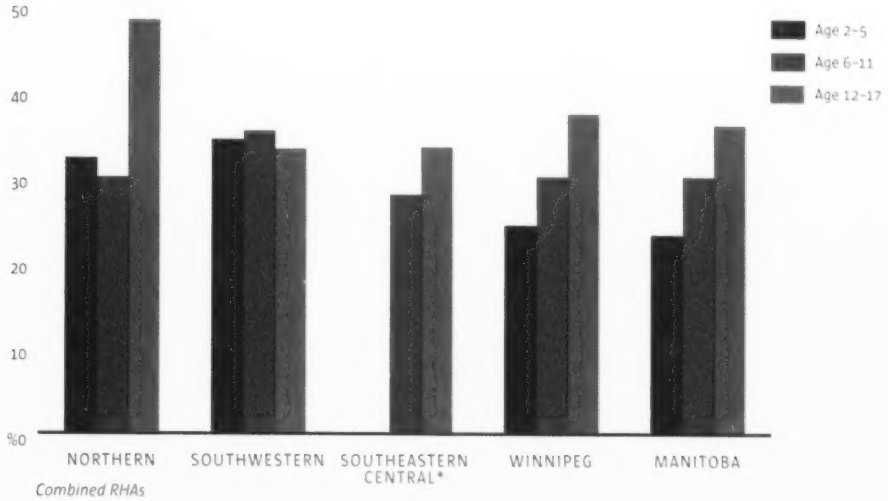
More boys living in northern Manitoba tended to be overweight/obese (35.2 per cent), compared to boys living in southeastern/central areas of the province (25.9 per cent) or in Winnipeg (30.2 per cent).

Much like northern Manitoba boys, girls living in the northern regions of the province were most likely to be overweight/obese (36 per cent), compared to girls living in southwestern areas (31.7 per cent), southeastern/central areas (26.6 per cent) and Winnipeg (33.3 per cent). Logistic regression analysis revealed that there was a downward linear trend from northern, southwestern, Winnipeg to southeastern/central areas in the prevalence of overweight/obesity in children, particularly in boys (Odds ratio 1.22, $p<0.07$).

Figure 8

Prevalence of Overweight/Obesity in Manitoba Children 2–17 Years Old

by Age Group and Combined Regional Health Authorities



* Insufficient numbers to report for age 2-5

	OVERWEIGHT / OBESE					
Age Group (Years)	**2–5**		**6–11**		**12–17**	
RHA	%	95% CI	%	95% CI	%	95% CI
Northern	32.1	17.5 - 46.6	29.9	17.3 - 42.5	48.2	34.2 - 62.2
Southwestern	34.3	19.7 - 48.9	35.3	25.7 - 44.9	33.2	22.5 - 44.0
Southeastern Central	F**		27.9	17.1 - 38.6	33.4	25.7 - 41.0
Winnipeg	24.3	12.0 - 36.6	30.0	21.1 - 38.8	37.3	29.3 - 45.2
Manitoba	23.2	15.8 - 30.5	30.0	23.5 - 36.4	36.0	30.3 - 41.6

Note 1: 95% CI refers to the 95th % confidence intervals.
Note 2: **Failed to report due to CV > 33.

Children two to five years old living in southwestern Manitoba had a higher prevalence of overweight/obesity (34.3 per cent), followed by northern Manitoba (32.1 per cent) and Winnipeg (24.3 per cent). The number of overweight/obese children living in southeastern/central Manitoba in this age group was too small to report.

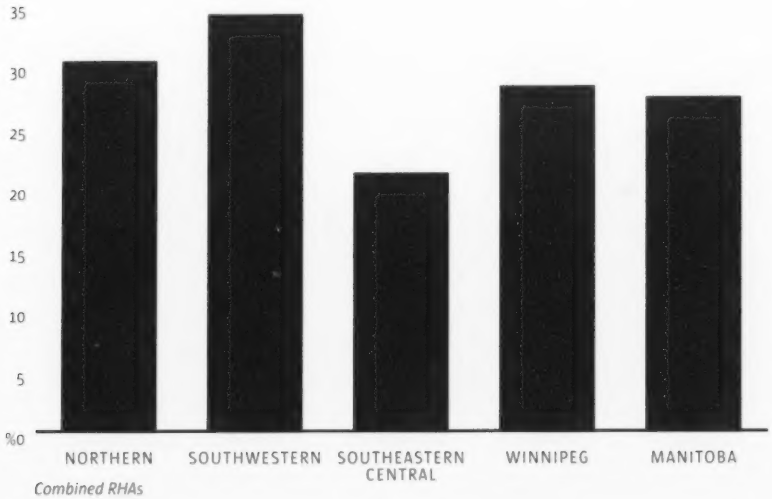
Children six to 11 years old living in southwestern Manitoba also had a higher prevalence of overweight/obesity (35.3 per cent), followed by children in northern Manitoba (29.9 per cent), Winnipeg (30 per cent) and southeastern/central Manitoba (27.9 per cent).

Adolescents 12 to 17 years of age living in northern Manitoba had a higher prevalence of overweight/obesity (48.2 per cent) than adolescents in Winnipeg (37.3 per cent), southwestern (33.2 per cent) or southeastern/central (33.4 per cent).

Figure 9.

Prevalence of Overweight/Obesity in Manitoba Children 2-11 Years Old

by Combined Regional Health Authorities



	OVERWEIGHT / OBESE		
RHA	%	95%CI	Estimated Population
Northern	30.3	21.3 - 39.3	1822
Southwestern	34.1	26.3 - 42.0	5933
Southeastern Central	21.1	14.2 - 28.1	7494
Winnipeg	28.2	21.7 - 34.7	22704
Manitoba	27.3	22.9 - 31.6	37953

Note: 95% CI refers to the 95th% confidence intervals.

Due to the small sample size in the two to five-year-old age group, children ages two to 11 were grouped together to explore any gender differences in the overweight/obesity rate in those sub-regions of Manitoba.

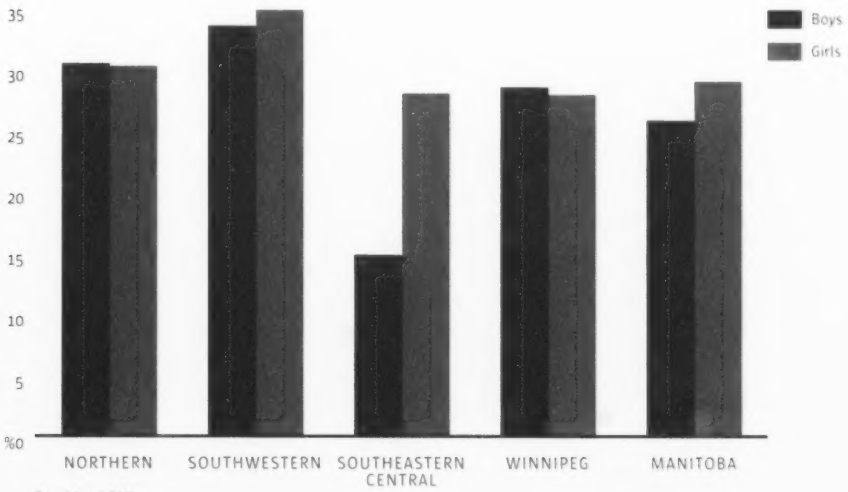
The highest prevalence of overweight/obesity among children two to 11 years old was noted in southwestern Manitoba (34.1 per cent). This was closely followed by the prevalence of overweight/obesity in northern Manitoba (30.3 per cent) and Winnipeg (28.2 per cent). The prevalence of overweight/obesity in children two to 11 years old living in southeastern/central Manitoba was notably lower, at 21.1 per cent. This difference did not reach statistical significance; this may have been due to a small sample size.

The provincial prevalence of overweight/obesity among children two to 11 years of age was 27.3 per cent. These data suggest that nearly 38,000 children aged two to 11 years in Manitoba are either overweight or obese.

Figure 10.

Prevalence of Overweight/Obesity in Manitoba Children 2-11 Years Old

by Combined Regional Health Authorities by Gender



Combined RHAs

OVERWEIGHT/OBESE

	Boys			Girls		
RHA	%	95% CI	Estimated Population	%	95% CI	Estimated Population
Northern	30.4	16.1 - 44.7	1001	30.2	18.1 - 42.4	822
Southwestern	33.5	19.6 - 47.6	2810	34.8	23.8 - 45.7	3123
Southeastern Central	14.8	7.5 - 22.2	2733	28.0	15.8 - 40.2	4761
Winnipeg	28.5	17.6 - 39.4	12855	27.9	17.4 - 38.4	9849
Manitoba	25.8	18.7 - 32.8	19399	29.0	23.1 - 34.9	18555

Note: 95% CI refers to the 95th% confidence intervals

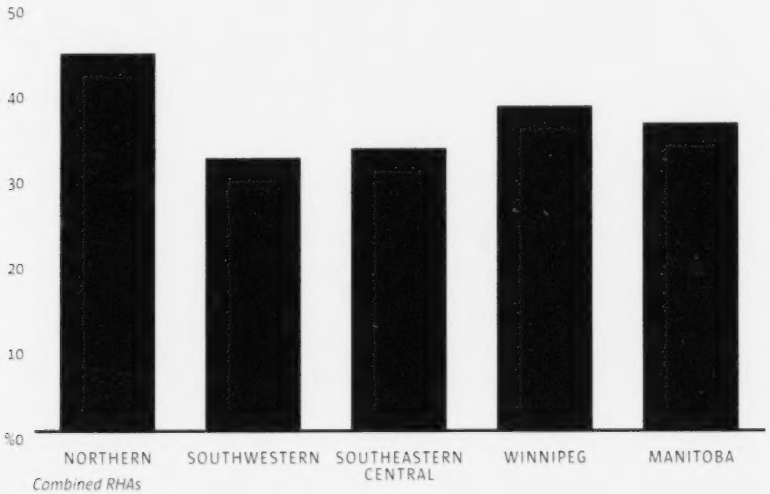
Approximately 26 per cent of boys ages two to 11 living in Manitoba, ranging from 14.8 per cent in southeastern/central to 33.5 per cent in southwestern Manitoba, were either overweight or obese. The exception was boys living in southeastern/central Manitoba, where the prevalence of overweight/obesity was notably lower at 14.8 per cent. This difference, however, was not statistically significant due to the relatively small sample size at the regional level.

The prevalence of overweight/obesity in Manitoba girls two to 11 years old was relatively consistent at about 30 per cent, ranging from 27.9 per cent in Winnipeg to 34.8 per cent in southwestern Manitoba.

Figure 11.

Prevalence of Overweight/Obesity in Manitoba Adolescents 12-17 Years Old

by Combined Regional Health Authorities



	OVERWEIGHT / OBESE		
RHA	%	95% CI	Estimated Population
Northern	44.2	31.4 - 57.0	1608
Southwestern	31.9	21.0 - 42.7	4029
Southeastern Central	33.0	25.3 - 40.6	8881
Winnipeg	37.9	29.2 - 46.6	19157
Manitoba	35.9	30.3 - 41.6	33675

Note: 95% CI refers to the 95th% confidence intervals.

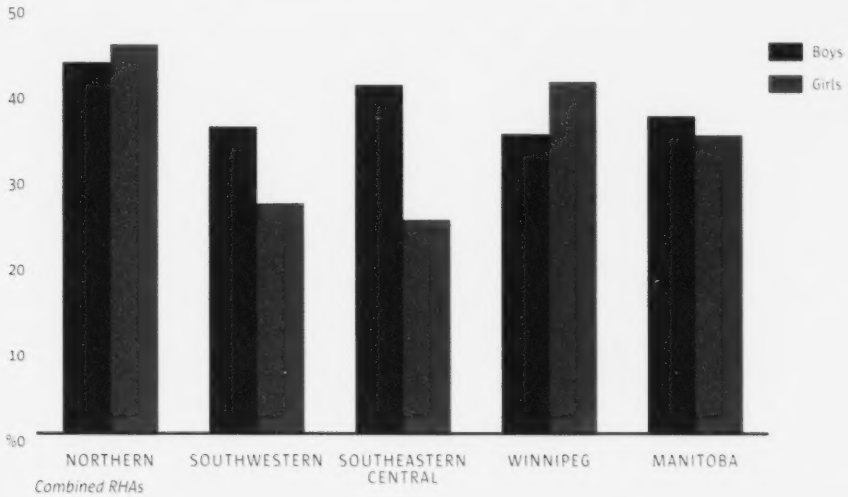
The highest prevalence of overweight/obesity among adolescents 12 to 17 years old was in northern Manitoba (44.2 per cent). This was followed by the prevalence of overweight/obesity in Winnipeg (37.9 per cent). The prevalence of overweight/obesity in adolescents 12 to 17 years old living in southeastern/central Manitoba (33.0 per cent) and in southwestern Manitoba (31.9 per cent) were notably lower. This difference did not reach statistical significance; this may have been due to a small sample size.

The provincial prevalence of overweight/obesity amongst adolescents 12 to 17 years old was 35.9 per cent. These data suggest that nearly 33,675 adolescents 12 to 17 years of age in Manitoba are either overweight or obese.

Figure 12.

Prevalence of Overweight/Obesity in Manitoba Adolescents 12-17 Years Old

by Combined Regional Health Authorities by Gender



OVERWEIGHT/OBESE

	Boys			Girls		
RHA	%	95% CI	Estimated Population	%	95% CI	Estimated Population
Northern	43.2	**26.1 - 60.3**	839	45.3	**29.0 - 61.6**	770
Southwestern	35.7	**21.3 - 53.9**	2565	26.8	**13.2 - 40.4**	1464
Southeastern Central	40.6	**19.4 - 52.0**	5639	24.9	**16.0 - 33.7**	3241
Winnipeg	34.9	**30.2 - 51.1**	8975	41.0	**25.2 - 56.9**	10182
Manitoba	37.0	**23.7 - 46.0**	18017	34.8	**24.9 - 44.6**	15657

Note: 95% CI refers to the 95th% confidence intervals.

Boys 12 to 17 years old in northern Manitoba had a higher prevalence of overweight/obesity (43.2 per cent) than boys in southwestern (35.7 per cent), southeastern central Manitoba (40.6 per cent) and Winnipeg (34.9 per cent). However, these differences were not statistically significant.

This north to south decrease in the prevalence of overweight was also noted in girls aged 12 to 17. Adolescent girls in northern Manitoba had a higher prevalence of overweight/obesity (45.3 per cent) as compared to girls in southwestern Manitoba (26.8 per cent), southeastern/central Manitoba (24.9 per cent) and Winnipeg (34.8 per cent).

C. Effects of Determinants of Health on Weight Status

This chapter explores how several determinants of health may be associated with rates of overweight and obesity in Manitoba children. Although there are a number of determinants, the data allowed us to explore the association of parental education, family income and food insecurity with overweight and obesity. Food insecurity has been negatively correlated with household income, as food-secure families generally have greater purchasing power. As such, these families may be able to purchase foods such as fruits and vegetables and dairy products, which lower-income families (potentially food-insecure families) are less able to afford (Kirkpatrick & Tarasuk, 2003).

Key Findings:

- Nearly half of children whose parents did not complete high school were overweight/obese.
- The prevalence of overweight/obesity decreased as parental education and household income increased.
- Over 40 per cent of children from food-insecure households were overweight/obese. Boys from food-insecure households were twice as likely to be overweight/obese as compared to boys from food-secure homes. No association was noted in girls; this may have been due to a small sample size.

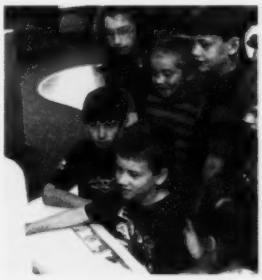
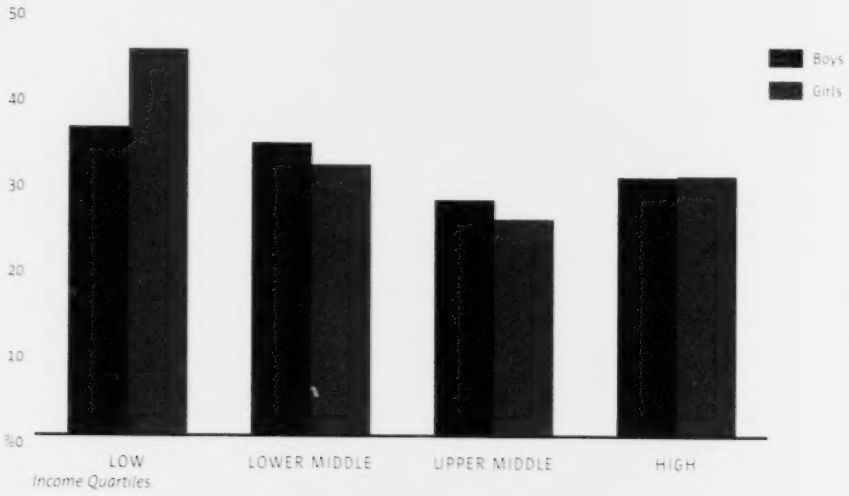


Figure 13.

Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years Old

by Total Family Income



OVERWEIGHT OBESE

	Boys		Girls	
Income Quartile	%	95% CI	%	95% CI
Low	**35.9**	14.5 - 57.3	**45.0**	31.3 - 58.7
Lower Middle	**34.1**	23.3 - 44.8	**31.6**	21.2 - 41.9
Upper Middle	**27.5**	21.2 - 33.8	**25.3**	17.7 - 32.9
High	**30.2**	19.6 - 41.0	**30.4**	18.7 - 42.0

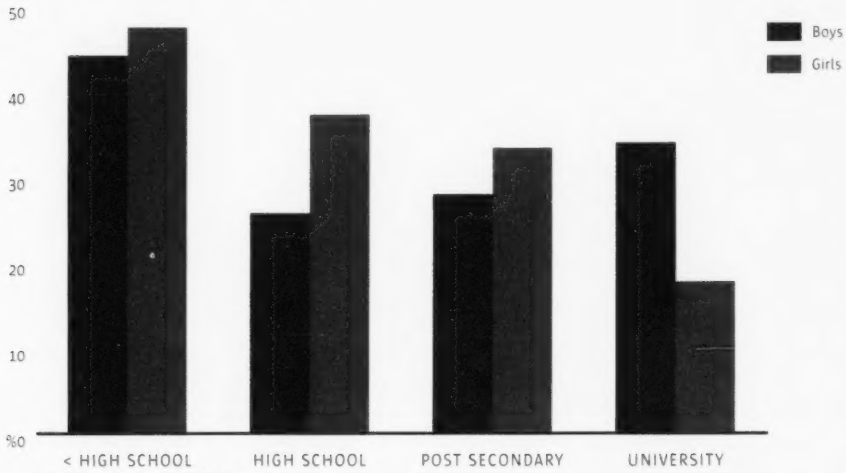
Note: 95% CI refers to the 95th% confidence intervals

In Manitoba children, there was an inverse association between the prevalence of overweight/obesity and family income quartile. The prevalence of overweight/obesity fell from 36 per cent in boys and 45 per cent in girls from low-income families, to 27.5 per cent and 25 per cent for boys and girls in upper-middle income families. This trend continued to high-income families where the prevalence of overweight/obesity increased slightly, to 30 per cent for both boys and girls.

Figure 14.

Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years Old

by Highest Level of Parental Education



	OVERWEIGHT / OBESE			
	Boys		Girls	
Highest Level of Parental Education	%	95% CI	%	95% CI
< High school	44.0	28.5 - 59.6	47.3	27.7 - 66.9
High school	25.6	10.0 - 41.2	37.1	24.3 - 49.9
Post-Secondary	27.8	20.8 - 34.8	33.2	22.1 - 44.3
University	33.8	22.0 - 45.6	17.6	6.6 - 28.7

Note: 95% CI refers to the 95th% confidence intervals.

More Manitoba boys and girls whose parents had not completed high school were overweight or obese (44 per cent and 47.3 per cent respectively) than their peers whose parents had completed high school (25.6 per cent and 37.1 per cent), some post-secondary education (27.8 per cent and 33.2 per cent) or university (33.8 per cent and 17.6 per cent).

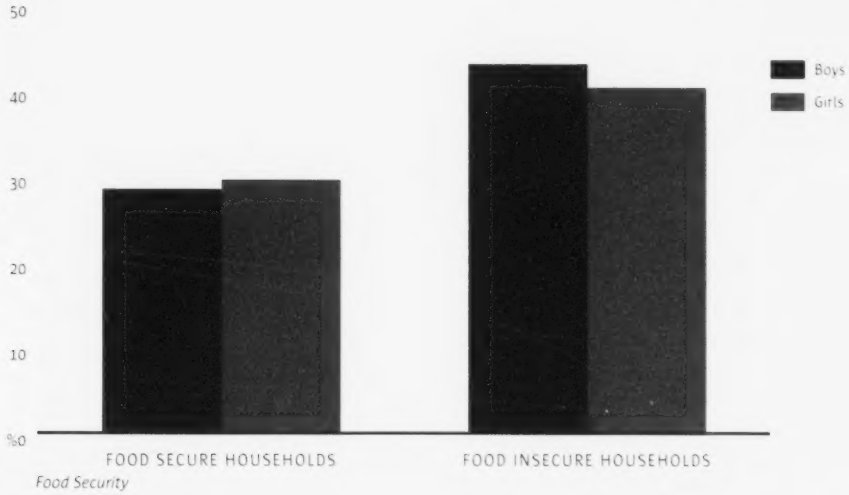
Among boys, there was a J-shaped association, in which boys whose parents had not completed high school had the highest prevalence of overweight/obesity. Boys whose parents had completed high school had the lowest prevalence of overweight/obesity. However, the prevalence of overweight/obesity in boys increased among parents who had completed some post-secondary training or university.

There was a negative linear correlation between overweight/obesity and parental education in girls. The prevalence of overweight/obesity decreased among girls whose parents had completed higher levels of education. This downward trend of overweight/obesity rate in girls according to parental education level was statistically significant ($p<0.05$) by logistic regression analysis.

Figure 15.

Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years Old

by Food Insecurity



	OVERWEIGHT OBESE			
	Boys		**Girls**	
Level of Food Security	**%**	95% CI	**%**	95% CI
Food Secure	**28.4**	23.4 - 33.3	**29.5**	23.4 - 35.7
Food Insecure	**43.0**	26.9 - 59.1	**40.3**	24.6 - 56.0

Note: 95% CI refers to the 95th% confidence intervals.

Food insecurity is defined as limited or uncertain availability of nutritionally adequate foods or a limited or uncertain ability to acquire foods in socially acceptable ways (see Appendix D).

In Manitoba, more children from homes in which food insecurity had been experienced in the past 12 months were overweight/obese (43 per cent of boys; 40.3 per cent of girls) compared to children from food-secure homes (28.4 per cent of boys; 29.5 per cent of girls). In other words, children from food-secure homes tended to be within a normal weight range (72 per cent of boys; 71 per cent of girls) than boys (57 per cent) and girls (60 per cent) from homes that experienced food insecurity. These differences reached statistical significance in boys (Odds Ratio = 2.09, $p<0.05$), but not in girls (Odds Ratio = 1.65, $p=0.18$).

D. Effects of Active Living on Weight Status

Active living and its contribution to energy balance is an important factor to assist in maintaining a healthy body weight. At an individual level, watching television or videos (Sherry, 2005), regular use of computers (Maras, 1997) or sedentary activity over one hour per day (Veugelers & Fitzgerald, 2005) are associated with an increased risk of overweight or obesity. Walking or biking to school is associated with a reduced risk of overweight or obesity (Go for Green, 1998). At an environmental level, limited access to recreation facilities (Canadian Institute of Health Information [CIHI], 2006) and living in areas perceived as not being safe (CDC, 2004) are barriers to physical activity.

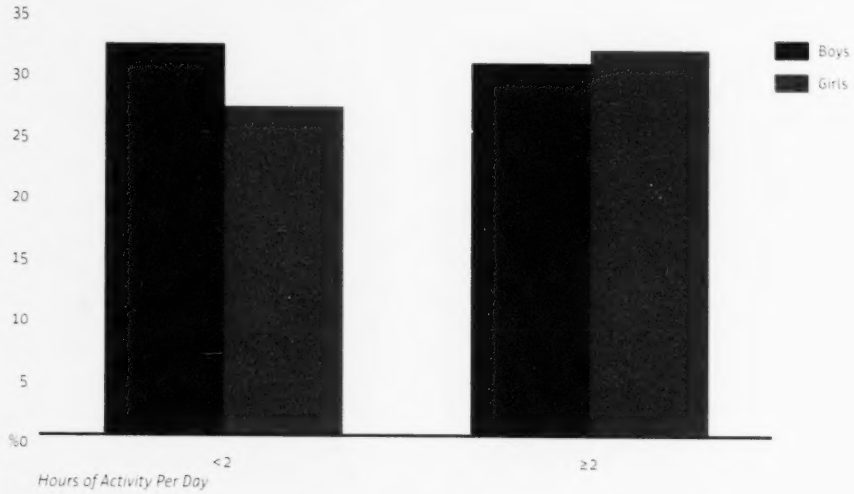
Key Findings:

- The prevalence of overweight/obesity was higher among boys six to 11 years of age who were sedentary for two or more hours per day compared to boys who were sedentary for less than two hours per day.
- Active and moderately active adolescents had a relatively lower prevalence of overweight/obesity compared to those who were inactive.
- 70 per cent of adolescent boys who were active less than 15 minutes per day were either overweight or obese.
- 40 per cent of adolescents who were sedentary ≥ three hours per day were overweight/obese.
- Girls 12 to 17 years old who were sedentary ≥ three hours per day were more likely to be overweight/obese as compared to girls who were sedentary < three hours per day.
- Adolescent boys who were infrequently active were over four times more likely to be overweight/obese compared to boys who were regularly or occasionally active.

Figure 16.

Prevalence of Overweight/Obesity in Manitoba Children 6-11 Years Old

by Hours of Daily Physical Activity



OVERWEIGHT / OBESE

	Boys		Girls	
Daily Physical Activity (Hours)	%	95% CI	%	95% CI
< 2	31.9	12.8 - 51.1	26.8	17.9 - 36.1
≥ 2	30.4	19.4 - 41.4	31.5	18.7 - 44.4

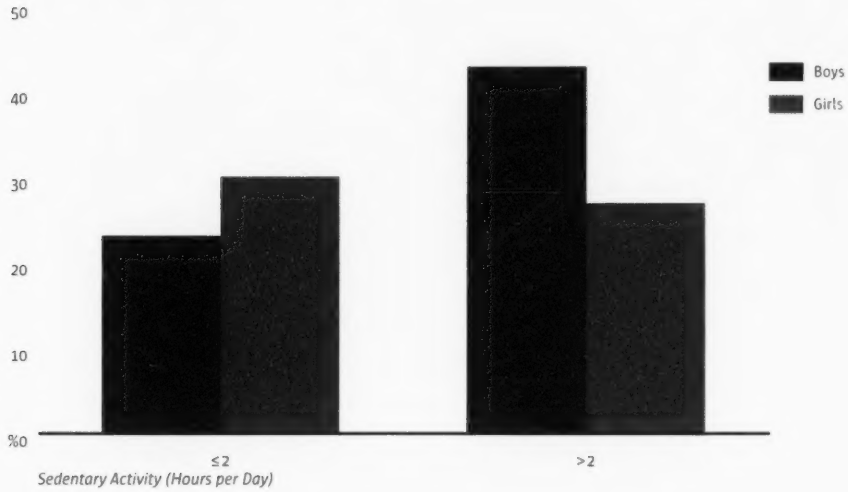
Note: 95% CI refers to the 95th% confidence intervals.

In Manitoba children six to 11 years old, there were no apparent differences in the prevalence of overweight/obesity based on hours of daily physical activity. It is difficult to draw any conclusions on the effects of physical activity on the prevalence of overweight/obesity in young children (ages six to 11) because proxy- or respondent-reported physical activity is highly subjective.

Figure 17

Prevalence of Overweight/Obesity in Manitoba Children 6-11 Years Old

by Hours of Daily Sedentary Activity



	OVERWEIGHT / OBESE			
	Boys		**Girls**	
Daily Sedentary Activity (Hours)	%	95% CI	%	95% CI
≤ 2	23.0	19.7 - 44.4	29.9	19.8 - 37.9
> 2	42.7	29.5 - 49.0	26.8	23.8 - 55.4

Note: 95% CI refers to the 95th% confidence intervals.

For children six to 11 years old, sedentary activities included watching television or videos, playing videogames and spending time on the computer playing games, e-mailing, chatting and surfing the Internet. (See Appendix D for a full definition of this variable.)

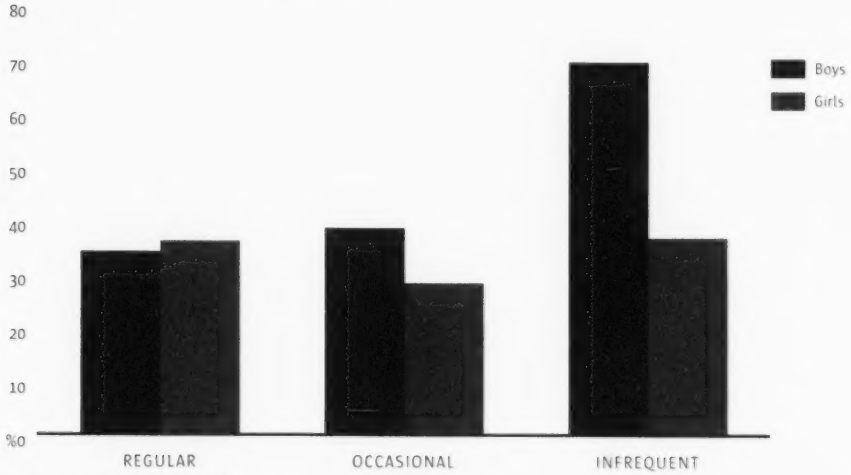
There was a positive association between sedentary activity and the rate of overweight/obesity amongst Manitoba boys six to 11 years old. More boys who were sedentary for more than two hours per day were overweight/obese (42.7 per cent), compared to boys who were sedentary for two or less hours per day (23 per cent).

This association was not apparent in girls. Daily sedentary activity did not seemingly impact the prevalence of overweight/obesity in Manitoba girls six to 11 years old. A similar percentage of girls who were sedentary for two hours or less a day were overweight/obese (29.9 per cent) as compared to girls who were sedentary for more than two hours per day (26.8 per cent).

Figure 18.

Prevalence of Overweight/Obesity in Manitoba Adolescents 12-17 Years Old

by Daily Physical Activity > 15 Minutes



OVERWEIGHT / OBESE

	Boys		Girls	
Frequency of Physical Activity	%	95% CI%	%	95% CI
Regular	34.1	25.1 - 43.0	36.1	23.8 - 48.4
Occasional	38.5	14.4 - 62.7	28.3	14.8 - 41.8
Infrequent	69.5	41.5 - 97.6	36.8	8.0 - 65.6

Note: 95% CI refers to the 95th% confidence intervals.

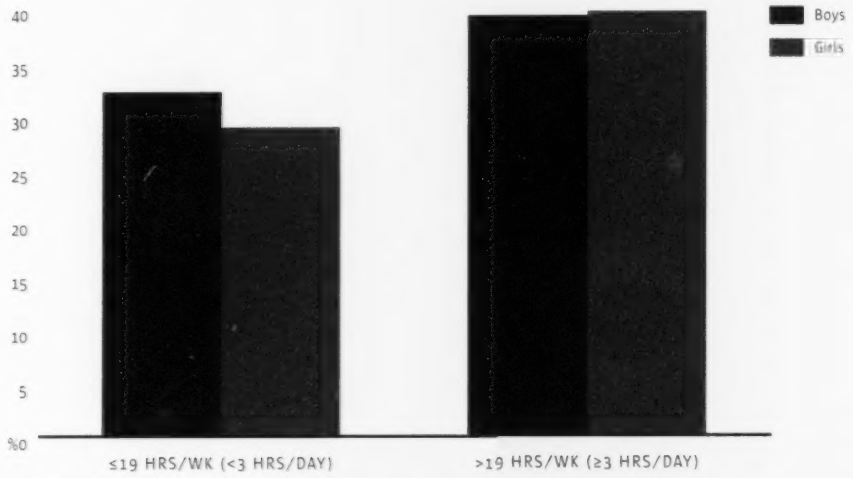
Among Manitoba boys 12 to 17 years old, there was a positive linear trend between the increasing prevalence of overweight/obesity and decreasing frequency of physical activity. Fewer adolescent boys who were active for more than 15 minutes per day were overweight/obese (34.1 per cent) compared to those who were occasionally active (38.5 per cent) or infrequently active (69.5 per cent). Logistic regression analysis revealed that being physically active is associated with a decreased likelihood of being overweight/obese (Odds Ratio = 0.23, $p<0.06$) for boys only.

There was no similar trend in the prevalence of overweight/obesity in girls 12 to 17 years old by the frequency of physical activity. Thirty-six (36.1) per cent of adolescent girls who were regularly active for more than 15 minutes per day were overweight/obese, while 28.3 per cent of girls who were occasionally active and 36.8 per cent of girls who were infrequently active were overweight/obese.

Figure 19.

Prevalence of Overweight/Obesity in Manitoba Adolescents 12-17 Years Old

by Weekly Sedentary Activity



	OVERWEIGHT / OBESE			
	Boys		**Girls**	
Sedentary Activity (Hours Weekly/Hours Daily)	%	95% CI	%	95% CI
≤ 19 (< 3)	32.1	19.7 - 44.4	28.8	19.8 - 37.9
> 19 (≥ 3)	39.2	29.5 - 49.0	39.6	23.8 - 55.4

Note: 95% CI refers to the 95th% confidence intervals.

Sedentary activity amongst adolescents included using a computer to play games, using the Internet; playing video games; watching television or videos and reading, other than for school or work. (See Appendix D for the complete definition of this variable.) For this variable, more sedentary was defined as more than 19 hours per week, or three hours or more per day, and less sedentary was defined as 19 hours or less per week, or less than three hours per day.

There was a positive association between the prevalence of overweight/obesity and sedentary activity in adolescents. Among boys who were less sedentary, 32.1 per cent were overweight or obese, whereas among those who were more sedentary, 39.2 per cent were overweight or obese.

In adolescent girls, 28.8 per cent who were less sedentary were overweight or obese, while nearly 40 per cent who were more sedentary were overweight or obese. The odds ratio of girls being more sedentary to those who were less sedentary was 1.45 ($p < 0.05$). Thus, girls who were more sedentary were 1.45 times more likely to be overweight/obese than those who were less sedentary.

E. Effect of Healthy Eating on Weight Status

Healthy eating and its contribution to energy balance is an important contributing factor to maintaining a healthy body weight. Two factors associated with a reduced risk of overweight or obesity are fruit and vegetable consumption (Ford et al., 2005) and smaller portion sizes (Sherry, 2005). Factors associated with an increased risk of overweight or obesity are increased consumption of calorie-dense foods (Janssen et al., 2006), soft drinks and fruit drinks (Welsh et al., 2005), skipping breakfast (Veugelers & Fitzgerald, 2005) and increased portion sizes (Sallis & Glanz, 2006).

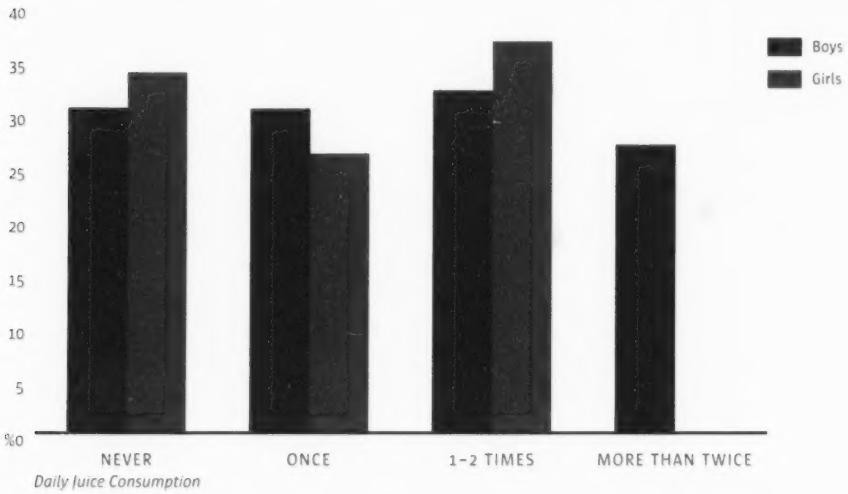
Key Findings:

- Children aged two to 17 years who ate fruits and vegetables less than five times per day were more likely to be overweight/obese compared to those who had fruits and vegetables five or more times per day.
- Girls 12 to 17 years who ate fruits and vegetables less than five times per day were significantly more likely to be overweight/obese compared to those who had fruits and vegetables five or more times per day. No such association was identified in boys 12 to 17 years old.

Figure 20.

Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years Old

by Daily Juice Consumption



	OVERWEIGHT / OBESE			
	Boys		Girls	
Frequency of Daily Juice Consumption	%	95% CI	%	95% CI
Never	30.4	23.0 - 37.8	33.7	24.7 - 42.8
Once	30.3	20.9 - 39.7	26.1	17.5 - 34.6
1-2 Times	32.0	19.4 - 44.6	36.6	17.2 - 55.9
More than Twice	26.9	14.6 - 39.1	F**	

Note 1: 95% CI refers to the 95th% confidence intervals.
Note 2: **Failed to report due to CV > 33.

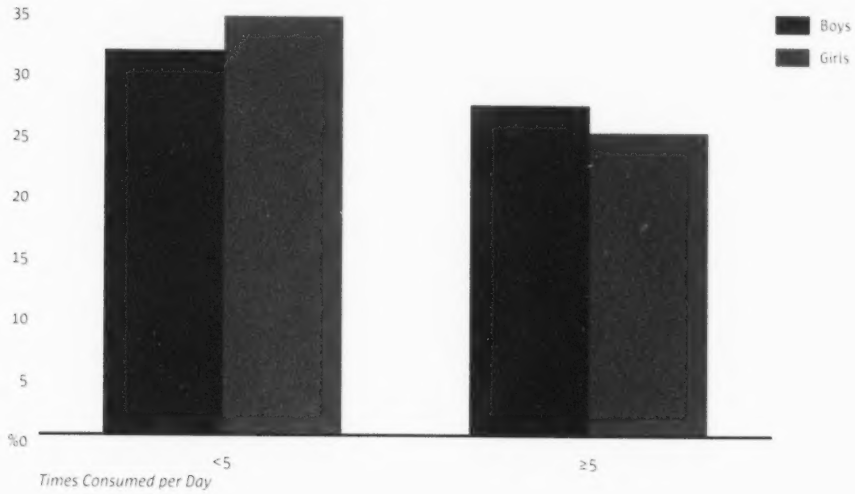
The frequency of fruit juice consumption was not associated with the prevalence of overweight/obesity in Manitoba boys two to 17 years of age. The same percentage (30.4 per cent) of boys who never consumed fruit juice and who drank fruit juice once daily (30.3 per cent) were overweight/obese, whereas 32 per cent of boys who drank fruit juice one to two times per day were overweight/obese, and nearly 27 per cent of boys who drank juice more than twice per day were overweight/obese.

In Manitoba girls aged two to 17 years, fruit juice consumption had a more pronounced effect on weight status, although none of the differences were statistically significant. Among girls who never drank fruit juice, 33.7 per cent were overweight/obese, whereas 26.1 per cent of girls who drank juice once per day were overweight/obese and 36.6 per cent of girls who drank juice one to two times per day were overweight/obese. The sample size for overweight/obese girls who drink juice more than twice per day was too small to report.

Figure 21.

Prevalence of Overweight/Obesity in Manitoba Children 2-17 Years Old

by Daily Fruit and Vegetable Consumption



	OVERWEIGHT / OBESE			
	Boys		Girls	
Frequency of Daily Fruit & Vegetable Consumption	%	95% CI	%	95% CI
<5	**31.4**	24.9 - 40.3	**34.2**	25.4 - 43.0
≥ 5	**27.0**	22.5 - 38.9	**24.8**	15.2 - 34.4

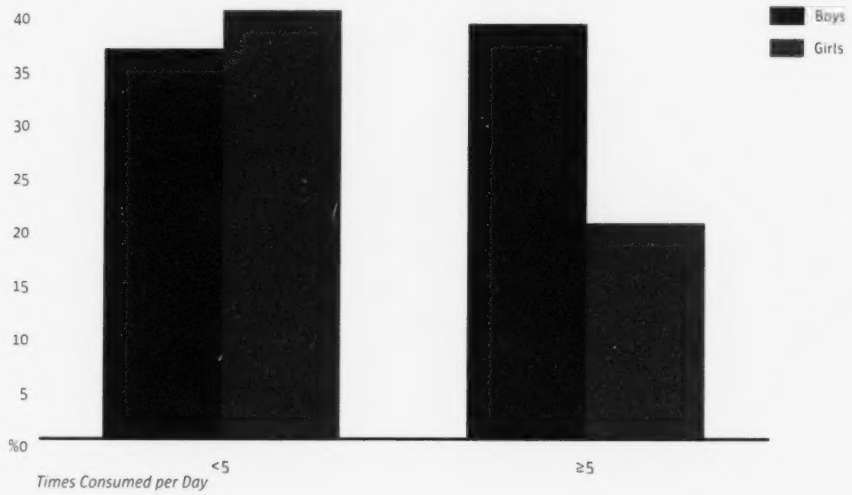
Note: 95% CI refers to the 95th% confidence intervals.

Daily fruit and vegetable consumption was negatively associated with overweight/obesity in Manitoba children two to 17 years old. More children who consumed fruits and vegetables less than five times per day were overweight/obese boys (31.4 per cent of boys; 34.2 per cent of girls) than children who consumed fruits and vegetables five or more times per day (27 per cent of boys; 24.8 per cent of girls).

Figure 22.

Prevalence of Overweight/Obesity in Manitoba Adolescents 12-17 Years Old

by Daily Fruit and Vegetable Consumption



	OVERWEIGHT / OBESE			
	Boys		Girls	
Frequency of Daily Fruit & Vegetable Consumption	%	95% CI	%	95% CI
<5	36.4	25.8 - 47.0	40.0	26.8 - 53.2
≥ 5	38.7	17.2 - 60.2	20.1	10.0 - 22.8

Note: 95% CI refers to the 95th% confidence intervals.

Daily fruit and vegetable consumption had little impact on overweight/obesity in Manitoba boys 12 to 17 years old. However, Manitoba girls 12 to 17 years old who ate fruits and vegetables less than five times per day were significantly more likely to be overweight/obese as compared to girls who ate fruits and vegetables five or more times per day. Logistic regression analysis revealed that girls 12 to 17 years old who had fruits and vegetables less than five times per day were nearly 1.5 times as likely to be overweight/obese than girls 12 to 17 years old who ate fruits and vegetables more often (Odds Ratio = 0.67; $p < 0.06$).

Summary

The analysis of the weight status of Manitoba children indicated that nearly 70 per cent of Manitoba children two to 17 years old were at a normal or healthy weight. This is similar to the 2004 national average of 74 per cent of children of the same age range (Shields, 2006). The prevalence of childhood overweight/obesity in Manitoba (31 per cent) in 2004 was **significantly higher** than the national average (26 per cent) of the same year (Shields, 2004). In both Manitoba and across Canada (Shields, 2006), off-reserve aboriginal children had a higher rate of overweight/obesity than non-aboriginal children.

Age makes a difference in overweight/obesity.
Across Manitoba and Canada (Shields, 2006), adolescents had a higher prevalence of overweight/obesity than children two to five years old or six to 11 years old. This was evident when considering rates for boys and girls both separately and together. The prevalence of overweight and obesity amongst pre-school children in Manitoba was based on a small number of children who were overweight/obese and thus should be interpreted with caution.

Where adolescents live seems to make a difference in overweight/obesity rates.
Adolescents in northern Manitoba had a considerably higher prevalence of overweight/obesity as compared to adolescents in other parts of the province. This was not the case for children two to 11 years old, as overweight/obesity rates were consistent across the combined regions and genders, except for boys two to 11 years old in the southeastern/central region, who had a substantially lower rate of overweight/obesity.

Socio-economic status affected weight status.
There was a higher prevalence of overweight/obesity amongst both boys and girls from low-income families in Manitoba. Shields (2004) reported that nationally, 28 per cent of children from lower-middle, middle and upper-middle income families were overweight or obese, compared to 25 per cent of children from low-income families and 23 per cent from high income families. In Manitoba, almost half of children from households in which parents had not completed high school were either overweight or obese. This is notably higher than the Canadian average of 31 per cent (Shields, 2006).

Over 40 per cent of children from food-insecure households were overweight/obese.
Boys from food-insecure households were twice as likely to be overweight/obese as compared to boys living in food-secure homes. However, the association between food insecurity and overweight/obesity remains controversial. Che and Chen (2001) found that people in food-insecure households were significantly more likely to be obese even after adjusting for age, gender and household income. Yet, other researchers have found no association between food insecurity and overweight among women, while men in food-insecure homes were significantly less likely to be overweight (Vozoris & Tarasuk, 2003).

Physical activity and fruit and vegetable intake both affected weight status.
Data from Manitoba and Canada (Shields, 2006; Shields, 2004) indicated that consumption of fruit and vegetables at least five times per day, as well as regular physical activity and decreased sedentary activity were beneficial in promoting normal weights or healthy weights. In Manitoba, boys six to 11 years old who were sedentary for more than two hours per day were more likely to be overweight/obese than boys of the same age who were sedentary less than two hours per day. Adolescent boys who were infrequently active were more likely to be overweight/obese, although this was not apparent for girls 12 to 17 years old. Adolescents who were sedentary for 20 or more hours per week also had a higher prevalence of overweight/obesity. Nationwide, "screen time" (time spent watching television or videos, playing video games or using the computer) was significantly associated with overweight/obesity in children aged six to 17 years (Shields, 2004).

This report identifies that rates of overweight and obesity are high in Manitoba children and adolescents. In 2004, the Manitoba government recognized the need to further enhance the health of Manitoba children. Through a public consultation process, the Healthy Kids, Healthy Futures Task Force developed strategies to improve the health status of all Manitobans. A series of 47 recommendations was made in the areas of educational health promotion, nutrition in schools, physical activity in schools, recreation facilities and access, recreation leadership, active transportation, injury prevention, low-income families, First Nations communities and mental heath and wellness. (Manitoba Healthy Living, 2005) During this time, the need to increase efforts to reduce the burden of chronic disease was also identified. The Chronic Disease Prevention Initiative (CDPI) began to fund and develop community-led activities to address chronic disease risk factors. Appendix B describes a number of Manitoba government and regional health authority activities with a specific focus on children that have been implemented to promote healthy eating, active living and chronic disease prevention to improve the health of Manitobans. The effectiveness of these interventions in improving the health status of Manitoba children will be monitored.

The findings of this report indicate that health disparities exist in four vulnerable sub-populations with higher rates of overweight and obesity than the general population of children and youth: adolescents and children living in the north, off-reserve aboriginal children, boys living in food-insecure households, and girls whose parents had not completed high school.

The extent of overweight and obesity in Manitoba children suggests that multiple strategies are needed to address social and environmental conditions, as well as individual lifestyle choices. The importance of continuing with existing activities to encourage and support children and adolescents to improve their eating habits, increase their physical activity and reduce sedentary behaviours is evident. Culturally appropriate physical education and healthy eating programs, and policies to meet the needs of off-reserve aboriginal children are important considerations. Efforts to improve access to affordable healthy foods – particularly in the North – remain a key area.

The report identifies more research questions to assist in policy formation and increase our understanding of the disparities of circumstances and health determinants on weight status. What is it about northern Manitoba that increases the likelihood of adolescents being overweight? Why is there a difference in prevalence of overweight/obesity in low-income families in Manitoba? Why are boys from food-insecure households more likely to be overweight than girls? Subsequent reports on food intake of children and further analysis will increase our understanding of potential causes and solutions to address overweight and obesity.

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Appendix A:

Definition of Overweight and Obesity in Children and Adolescents

While there remains no universally-accepted definition of overweight and obesity in children, Cole and colleagues (2000) developed percentile curves through the cut off points of 25 kg/m^2 and 30 kg/m^2 for adult overweight and obesity, respectively, which were averaged for age – and gender-specific cut-off points for 2 to 18 years old. That is, the points of BMI percentile curves that passed through the values of 25 kg/m^2 and 30 kg/m^2 at age 18 were derived. These are the definitions recognized by the International Obesity Task Force (IOTF, 2000) and are the definitions used in this report and CCHS 2.2 survey design. These definitions offer a means by which to project a child's likelihood of being overweight or obese in adulthood.

Table A.1

International Obesity Task Force Definitions of Overweight and Obesity in Children and Adolescents

	Overweight cut-off BMI greater than or equal to:		Obese cut-off BMI greater than or equal to	
Age (years)	**Boys**	**Girls**	**Boys**	**Girls**
2	18.11	18.02	20.09	19.81
2.5	18.13	17.76	19.80	19.55
3	17.89	17.56	19.57	19.36
3.5	17.69	17.40	19.39	19.23
4	17.55	17.28	19.29	19.15
4.5	17.17	17.19	19.26	19.12
5	17.42	17.15	19.30	19.17
5.5	17.45	17.20	19.47	19.34
6	17.55	17.34	19.78	19.65
6.5	17.71	17.53	20.23	20.08
7	17.92	17.75	20.63	20.51
7.5	18.16	18.03	21.09	21.01
8	18.44	18.35	21.60	21.57
8.5	18.76	18.69	22.17	22.18
9	19.10	19.07	22.77	22.81
9.5	19.16	19.15	23.39	23.16
10	19.84	19.86	24.00	24.11
10.5	20.20	20.29	24.57	24.77
11	20.55	20.74	25.10	25.42
11.5	20.89	21.20	25.58	26.05
12	21.22	21.68	26.02	26.67
12.5	21.56	22.14	26.43	27.24
13	21.91	22.58	26.84	27.76
13.5	22.27	22.98	27.25	28.20
14	22.62	23.34	27.63	28.57
14.5	22.96	23.66	27.98	28.87
15	23.29	23.94	28.3	29.11
15.5	23.60	24.17	28.60	29.29
16	23.90	24.37	28.88	29.43
16.5	24.19	24.54	29.14	29.56
17	24.46	24.70	29.41	29.69
17.5	24.73	24.85	29.70	29.84
18	25.00	25.00	30.00	30.00

Adapted from Cole, T.J., Bellizzi, M.C., Flegal, K.M., & Dietz, W.H. (2000). Establishing a standard definition for child overweight and obesity worldwide: International survey. *British Medical Journal*, 320 (7244): 1240-1243.

Appendix B:

Manitoba Government and Regional Health Authority Initiatives related to Healthy Eating, Active Living and Chronic Disease Prevention

The mandate of Manitoba Health and Healthy Living is to create conditions and support behaviours that promote the best possible health choices for everyone. Efforts are focused on the following seven pillars of Healthy Living: Active Living, Chronic Disease Prevention, Healthy Eating, Healthy Sexuality, Injury Prevention, Mental Health Promotion and Tobacco Reduction. More information can be found at the website **www.gov.mb.ca/healthyliving**.

Specific initiatives related to active living, chronic disease prevention and healthy eating for children and/or communities include:

- Chronic Disease Prevention Initiative (CPDI) is a partnership between Manitoba Healthy Living, Public Health Agency of Canada, Regional Health Authorities, the Alliance for Chronic Disease Prevention and communities. CDPI provides a community-led, evidence-based approach to primary prevention of chronic diseases that are major contributors to mortality in Manitoba (cardiovascular disease, cancer, diabetes, lung and renal diseases) by promoting activities that may prevent chronic illnesses, including healthy eating, active living and smoking cessation. There are 56 approved Community Action Plans; several extend the reach of CDPI into more than one community. Thirty-six (36) percent of all approved Community Action Plans are being led by First Nations on-reserve communities.
- The Healthy Schools initiative is a partnership between Manitoba Health & Healthy Living, Manitoba Education Citizenship & Youth, Healthy Child Manitoba and Regional Health Authorities. Healthy Schools is Manitoba's comprehensive school health initiative, focusing on the development of health promoting strategies for school communities. Healthy Schools promotes lifelong wellness, including a strong focus on good nutrition and increased opportunities for physical activity, for students, school staff, parents, families and their local neighbourhoods.
- The Manitoba School Nutrition Initiative, including the School Nutrition Handbook, School Food Guidelines, and the Food in Schools website, is designed to help school communities develop nutrition policies and implement changes to promote healthier eating options.
- Manitoba *in motion*, a provincial strategy to help all Manitobans make physical activity part of their daily lives for health and enjoyment, was launched in October 2005. The goal is to increase physical activity in the province by 10 per cent by the year 2010. The provincial government has joined with community partners in physical activity, health, healthy living, recreation, sport and education to raise activity levels and reduce barriers to physical activity. The initiative is co-led by Manitoba Health and Healthy Living and Manitoba Culture, Heritage and Tourism. Manitoba *in motion* includes targeted strategies for priority populations including children and youth. A Healthy School in motion values the benefits of physical activity and ensures that it is a visible priority in daily school life.

Other government departments are also involved in promoting healthy eating, active living and chronic disease prevention. Healthy Child Manitoba works with families, multiple government departments and communities to improve the well-being of Manitoba's children and youth. Programs include Healthy Baby – a two part program of financial benefits and community supports for pregnant women; Baby First and Early Start home visiting programs, and Triple P Parenting. The Northern Healthy Foods Initiative led by Aboriginal and Northern Affairs addresses issues of access to food and healthy eating in northern Manitoba. Manitoba Education, Citizenship and Youth has developed a comprehensive school physical education and health curriculum, and has extended mandatory physical education requirements to grades 11 and 12. Parent-Child Coalitions, located in all RHAs and in Winnipeg

community areas, are mandated to work with their communities in the areas of nutrition, parenting, literacy and capacity building. Results from the province-wide Early Development Instrument reflect the five domains measuring a kindergarten child's readiness for school. The domain of physical health and well-being speaks to healthy weights; coalitions and school divisions utilize their respective annual population-based data to work with the community to improve the readiness of each cohort of preschoolers for kindergarten.

From a health services perspective, the regional health authorities have been delegated service planning and delivery through *The Regional Health Authority Act*. Over the summer of 2006, each regional health authority completed a survey describing policies, programs and activities addressing healthy weights and obesity. Most regional health authorities identified that nutritionists and/or dietitians are employed to plan, implement and evaluate nutrition policies and programs. The following is a summary of regional policies, programs and activities related to the promotion of healthy weights and obesity:

- Prenatal and postnatal nutrition education for parents such as the Healthy Baby program and other public health initiatives
- Breast feeding promotion, advocacy and support
- Family-focused activities such as family fun nights, fitness programs and cooking classes
- Community-based nutrition activities such as community kitchens, newsletters, community gardens and distribution of nutrition resources
- Implementation of a preschool literacy and healthy eating program
- Daycare menu reviews and nutrition projects
- Wellness fairs for parents of preschoolers.
- Nutrition counseling by dietitians related to nutritional concerns including weight loss in clinical and out-patient settings
- Partnerships with schools to develop school nutrition policy, provide nutritious foods through school meal programs, increase opportunities for physical activity and teach cooking skills
- Partnerships with recreation centres to offer healthier food choices
- Participation in health professional and community networks to facilitate partnerships and planning related to health, diabetes and chronic disease

Appendix C:
Detailed Technical Tables

Table C.1
Descriptive Statistics of Overweight and Obese Children
by Age Group and Gender in Manitoba (2004)

	Overweight				Obese				Overweight/Obese			
Ages Years	Numerator Size	%	95% CI		Numerator Size	%	95% CI		Numerator Size	%	95% CI	
Overall												
2-5	42	15.0	8.6	21.3	21	8.2	3.6	12.8	63	23.2	15.8	30.5
6-11	86	21.8	7.2	26.6	45	8.1	4.4	11.9	131	29.9	23.5	36.4
12-17	62	10.0	7.5	12.6	62	10.1	7.5	12.6	202	35.9	30.3	41.6
Total	268	21.8	19.1	24.6	128	8.9	6.9	10.9	396	30.7	27.3	34.2
Boys												
2-5	F*				F*				33	19.2	9.5	29.0
6-11	43	22.4	11.6	33.2	20	8.8	3.7	13.8	63	31.1	19.1	43.1
12-17	79	26.8	20.7	32.9	34	10.2	6.4	14.0	113	36.6	29.7	44.2
Total	145	21.7	17.5	25.9	64	8.5	5.8	11.2	209	30.2	25.0	35.4
Girls												
2-5	19	17.4	9.5	25.2	F*				30	29.3	18.5	40.2
6-11	43	21.3	12.6	29.9	F*				68	28.8	21.4	36.2
12-17	61	24.8	16.3	33.3	28	10.0	6.0	13.9	89	34.8	24.9	44.6
Total	123	22.0	16.9	27.0	64	9.4	6.6	12.2	187	31.4	25.8	37.0

Note: *Failed to report due to CV > 33.

Table C.2

Multivariable Logistic Regression Analyses on the Risk Factors for Overweight/Obesity

in Boys and Girls Ages 2-17 Years in Manitoba (2004)

	Boys		Girls	
	p-value	Adjusted OR (95% CI)	p-value	Adjusted OR (95% CI)
Age Groups	0.03	1.5 (1.1 - 2.2)	NS[3]	1.3 (0.9 - 1.7)
Parental Education	NS[3]	0.9 (0.6 - 1.4)	0.03	0.6 (0.4 - 1.0)
Income Adequacy	NS[3]	0.9 (0.6 - 1.2)	NS[3]	1.0 (0.8 - 1.2)
Health Region*[1]	0.07	1.2 (1.0 - 1.5)	NS[3]	1.2 (1.0 - 1.6)
Aboriginal Origin	NS[3]	1.2 (0.4 - 3.3)	NS[3]	1.4 (0.5 - 4.3)
Food Insecurity	0.04	2.1 (1.4 - 4.2)	NS[3]	1.7 (0.8 - 3.4)
≥ 5x Daily Fruit/Veg*[2]	NS[3]	1.0 (0.4 - 2.6)	NS[3]	0.8 (0.3 - 1.9)

All risk factors were adjusted for age.

[1] Combined Health Region was defined as following:
0 = Assiniboine/Parkland/Brandon
1 = Winnipeg
2 = Northeast/Southeast/Interlake/Central
3 = Burntwood/NOR-MAN/Churchill

[2] Consumption of fruits and vegetables 5 times or more per day. Indicates frequency of consumption, not quantity.

[3] NS = not significant

Table C.3.

Multivariable Logistic Regression Analysis on Risk Factors for Being Either Overweight or Obese

for Boys and Girls Ages 2-11 in Manitoba (2004)

	Boys		Girls	
	p-value	OR (95% CI)	p-value	OR (95% CI)
Parental Education	NS[3]	1.0 (0.1 - 2.4)	0.09	0.6 (0.4 - 1.1)
Family Income Adequacy	NS[3]	0.9 (0.6 - 1.3)	NS[3]	0.8 (0.5 - 1.1)
Health Region*[1]	0.01	1.5 (1.1 - 1.9)	NS[3]	1.1 (0.8 - 1.5)
Aboriginal Origin	NS[3]	2.3 (0.7 - 7.1)	NS[3]	2.0 (0.7 - 5.8)
Food Insecurity	NS[3]	2.0 (0.8 - 5.0)	NS[3]	1.2 (0.4 - 3.8)
≥= 5x Daily Fruit/Veg*[2]	NS[3]	0.8 (0.3 - 2.0)	NS[3]	0.9 (0.3 - 2.4)

[1] Combined Health region was defined as following:
0 = Assiniboine/Parkland/Brandon (South Western)
1 = Winnipeg
2 = North East/Southman/Interlake/Central (South Eastern Central)
3 = Burntwood/NOR-MAN/Churchill (Northern Rural)

[2] Consumption of fruits and vegetables 5 times or more per day. Indicates frequency of consumption, not quantity.

[3] NS = not significant

Table C.4

Multivariable Logistic Regression Analyses on Physical and Sedentary Activity and Daily Fruit and Vegetable Consumption

by Overweight/Obese Manitoba Adolescents Ages 12-17 (2004)

	Boys		Girls	
	p-value	OR (95% CI)	p-value	OR (95% CI)
Parental Education	NS*4	0.8 (0.6 - 1.2)	0.06	0.7 (0.4 - 1.0)
Income Adequacy	NS*4	0.8 (0.6 - 1.2)	NS*4	0.9 (0.6 - 1.3)
Food Insecurity	0.10	2.4 (0.8 - 7.0)	0.09	3.4 (0.8 - 14.0)
Health Region	NS*4	1.0 (0.7 - 1.2)	0.10	1.2 (1.0 - 1.6)
Aboriginal	NS*4	1.0 (0.4 - 2.8)	NS*4	1.6 (0.5 - 5.2)
Regular Physical Activity*1	0.06	0.2 (0.1 - 1.1)	NS*4	0.9 (0.2 - 3.5)
Sedentary Activity*2	NS*4	1.4 (0.9 - 2.1)	0.03	1.5 (1.1 - 2.0)
≥= 5x Fruit/Veg Daily*3	NS*4	1.1 (0.3 - 3.8)	0.06	0.4 (0.1 - 1.0)

*1 Includes regular and occasional physical activities that lasted more than 15 minutes per activity.

*2 Includes sedentary activities (computer games, Internet, video games, TV or reading) either 19 or less hours or 20 or more hours per week in the last three months.

*3 Consumption of fruits and vegetables five times or more per day.

*4 Not significant

Appendix D:

Definitions of Variables

Off-Reserve Aboriginal Culture

Off-reserve aboriginal culture was based on respondent-declared aboriginal status (North American Indian, Métis or Inuit).

Family Income Adequacy Quartiles

Family income quartiles are based on family income adequacy for the number of people residing in the household. (See Table D.1)

Table D.1

Family Income Adequacy Quartiles

Income Quartile	Income Range (Canadian Dollars) for Number of Persons in the Household
Lowest	<$15,000 if 1-2 people <$20,000 if 3-4 people <$30,000 if 5+ people
Lower Middle	$15,000 – 29,999 if 1-2 people $20,000 – 39,999 if 3-4 people $30,000 – 59,999 if 5+ people
Upper Middle	$30,000 – 59,999 if 1-2 people $40,000 – 79,999 if 3-4 people $60,000 – 79,999 if 5+ people
Highest Income	≥ $60,000 if 1-2 people ≥ $80,000 if 3+ people

Food Insecurity

Food insecurity is defined as limited or uncertain availability of nutritionally adequate foods or a limited or uncertain ability to acquire foods in socially acceptable ways (Canadian Community Health Survey Cycle 2.2 on Nutrition, 2004). Participants were read 19 statements designed to determine if their household was able to afford the food they required in the previous 12 months. These questions were written specifically to ascertain whether a condition/ behaviour occurred due to household financial limitations, and included phrases such as "because you and other adults in the household couldn't afford that" or "because there wasn't enough money for food." Food insecurity was determined based on participants' replies of whether each statement was often true, sometimes true, or never true in the past 12 months. These questions were answered by a knowledgeable member of the household. For the purposes of this report, food insecurity was dichotomized as food secure or food insecure. Food insecure included food insecurity without hunger, with moderate hunger and with severe hunger.

Physical Activity in Six to 11-Year-Olds

This newly derived variable estimates the total number of hours per day the child usually takes part in physical activities at school or outside of school. It also considers that children's physical activity is different from that of adolescents. Participants were asked six questions to determine the physical activity level of six to 11-year-olds in the home. These questions focused on the seven days prior to the survey, as well as in a typical week. Participants were asked about whether the child had been physically active for at least 60 minutes outside of school overall – while participating in lessons or league/team sports, during his/her free time at school (such as lunch), as well as in class doing some form of physical activity.

Sedentary Activities in Six to 11-Year-Olds

This newly derived variable estimates the total number of hours per day a child six to 11 years old participates in sedentary activities, including watching television or videos, playing video games and spending time on the computer playing games, e-mailing, chatting and surfing the Internet. Participants were asked two questions to determine the sedentary activity level of six to 11-year-olds in the home. These questions addressed time spent watching television or videos, playing video games, or using the computer for games, e-mail, chatting and surfing the Internet.

Physical Activity Index in 12 to 17-Year-Olds
This variable measures average daily energy expenditure during leisure time activity over the three months prior to this survey for individuals 12 to 17 years old. Energy expenditure is calculated using the frequency and duration per session of physical activity as well as metabolic equivalents (METs). METs are a value of metabolic energy costs expressed as a multiple of the resting metabolic rate. They are generally expressed in three intensity levels. As the CCHS 2.2 questions did not query respondents about intensity levels of activity, METs used for the purpose of this report are based on the low intensity value of each activity. This is the approach adopted by the Canadian Fitness and Lifestyle Research Institute because individuals tend to overestimate the intensity, frequency and duration of their activities. Participants were asked 23 questions to determine daily energy expenditure of 12 to 17-year-olds in the home. The number of questions varied according to the number of physical activities in which adolescents engaged. The types of physical activity included in this survey were walking for exercise, gardening or yard work, swimming, bicycling, popular or social dance, home exercises, ice hockey, ice skating, in-line skating or rollerblading, jogging or running, golfing, exercise class or aerobics, downhill skiing or snowboarding, bowling, baseball or softball, tennis, weight training, fishing, volleyball, basketball, soccer, any other physical activity or no physical activity at all.

Frequency of All Physical Activity >15 Minutes in 12 to 17-Year-Olds
Based on participants' responses to the types of physical activity in which they engaged as per the variable, Physical Activity Index in 12 to 17-Year-Olds, they were asked a maximum of 48 questions about the time (in minutes) they spent doing each activity. This variable measures the total number of times per month that respondents 12 and older took part in physical activity lasting more than 15 minutes. This variable calculates a one-month average by dividing the total reported frequency by three. This variable was adapted from the Ontario Health Survey.

Sedentary Activity in 12 to 17-Year-Olds
Respondents were asked four questions about the number of hours in a typical week, over the last three months, they engaged in sedentary activity. These activities included using a computer to play games, using the Internet, playing video games, watching television or videos and reading, other than for school or work.

Fruit Juice Consumption
Participants were asked one question about how often they drank fruit juices, such as orange, grapefruit or tomato. This variable indicates the usual number of times per day the respondent had fruit juice; it is not a measure of the amount of juice consumed.

Fruit Consumption
Participants were asked about the usual number of times per day fruit was consumed.

This variable indicates the usual number of times per day the respondent consumes fruit, excluding fruit juice. It is a measure of the frequency of consumption per day, not the amount consumed.

Fruit and Vegetable Consumption
The variable indicates the total number of times per day the respondent eats fruits and vegetables; it does not consider the amount consumed. Participants were asked four questions regarding their consumption – including frequency of consumption – of green salad; potatoes excluding French fries, fried potatoes or potato chips; carrots and other vegetables.

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